COEUR D'ALENE LAKE MANAGEMENT PLAN

Coeur d'Alene Tribe

Clean Lakes Coordinating Council

Idaho Division of Environmental Quality

COEUR D'ALENE LAKE

MANAGEMENT PLAN

Kootenai, Benewah and Shoshone Counties, Idaho

Approval, Recommendation, Policy Statements and Comments

The Clean Lakes Coordinating Council approves and recommends the Coeur d'Alene Lake Management Plan to the county commissions and the Coeur d'Alene Tribal Council. The council provides these additional policy statements and comments:

- That the Clean Lakes Coordinating Council is empowered to coordinate the implementation of the plan;

- That the council does not promote or support land use that degrades water quality, but encourages those land uses that protect this valuable resource;

- That recognizing that the timber and surface mining industries are the only land users which have mandatory best management practices (BMPs), we recommend that reasonable and mandatory BMPs be developed for other land users;

- That recognizing that each waterbody has somewhat different chemical characteristics, the council recommends that site specific water quality criteria be developed for the lake as funding permits.

Susan MacLeod, Chairperson Date

Robert ~~Bob~~ Hammes Date

Dr. Orland P. Scott Date

Robert Hall Date

Bill Seaton Date

COUNTY COMMISSIONS APPROVAL

ACCEPTED BY THE BENEWAH COUNTY BOARD OF COMMISSIONERS:

Jack Buell	Date	George Mills Jr.	Date
N.L. (Bud) McCall	Date		

ACCEPTED BY THE KOOTENAI COUNTY BOARD OF COMMISSIONERS:

Dick Compton	Date 9/19/96	Dick Panabaker	Date 9/19/96
Bob Macdonald	Date 9/19/96		

ATTEST
DANIEL J. ENGLISH, CLERK
BY: _____
Deputy Clerk

ACCEPTED BY THE SHOSHONE COUNTY BOARD OF COMMISSIONERS:

Sherry Krulitz 4/22/96	Date	Jack King 4-22-96	Date
R. Gary Waters 4/22/96	Date		

COEUR D'ALENE TRIBE APPROVAL
of the
COEUR D'ALENE LAKE MANAGEMENT PLAN

ACCEPTED BY THE COEUR D'ALENE TRIBE:

Ernest L. Stensgar 7/8/96
Ernest L. Stensgar, Chairman Date

Resolution Number CDA 215-A (96)

APPROVAL OF LAKE MANAGEMENT PLAN CDA Resolution 215(96)-A

WHEREAS, the Coeur d'Alene Tribal Council has been empowered to act for and on behalf of the Coeur d'Alene Tribe, pursuant to the Revised Constitution and By-Laws, adopted by the Coeur d'Alene Tribe by referendum, November 10, 1984, and approved by the Secretary of the Interior, Bureau of Indian Affairs, December 21, 1984; and

WHEREAS, the Coeur d'Alene Tribe assisted in the development of the Coeur d'Alene Lake Management Plan; and

WHEREAS, the management plan for Lake Coeur d'Alene is in its final format and has been reviewed by the Tribal staff and now requires acceptance by the Coeur d'Alene Tribal Council; and

WHEREAS, the Coeur d'Alene Tribal Natural Resource Department recommends approval by the Trial Council.

NOW THEREFORE BE IT RESOLVED, the Coeur d'Alene Tribal Council accepts the recommendation of the Natural Resource Department and approves the management plan prepared for Lake Coeur d'Alene; and,

FURTHER BE IT RESOLVED, that the Coeur d'Alene Tribal Council authorizes the Chairman to sign the Lake Management Plan for Coeur d'Alene Lake.

CERTIFICATION

The foregoing resolution was adopted at a meeting of the Coeur d'Alene Tribal Council held at the Tribal Headquarters, near Plummer, Idaho on June 27, 1996, with the required quorum present, by a vote of 6 FOR and 0 AGAINST.

Ernest L. Stensgar, Chairman
Coeur d'Alene Tribal Council

Norma Peone, Secretary
Coeur d'Alene Tribal Council

ACKNOWLEDGEMENTS

The Coeur d'Alene Lake Management Plan was developed through the combined efforts of citizens and governmental agencies coordinated under the umbrella of the Coeur d'Alene Basin Restoration Project. The core planning team included representatives of the commissions of Benewah, Kootenai and Shoshone Counties, the Clean Lakes Coordinating Council, Coeur d'Alene Tribe, Idaho Division of Environmental Quality and U. S. Geological Survey.

Scoping and informational meetings as well as a monthly newsletter were organized by the public involvement coordinators of the Coeur d'Alene Basin Restoration Project and Idaho Division of Environmental Quality. Several members of the Citizen's Advisory Committee of the Coeur d'Alene Basin Restoration Project gave informational talks on the lake and the planning effort to numerous business groups and civic organizations. The technical advisory groups which developed the plan's action items were facilitated by staff of the Clean Lakes Coordinating Council, Coeur d'Alene Basin Restoration Project, Coeur d'Alene Tribe, Idaho Division of Environmental Quality and Panhandle Health District.

Agency and citizen participants in the technical advisory groups numbered over eighty. These agencies and individuals are listed in Appendix A of the plan.

FORWARD

Participation of the Coeur d'Alene Tribe in the development and implementation of this lake plan is part of the Tribe's involvement as one of the three sovereign powers in the Coeur d'Alene Basin Restoration Project. As documented in the Memorandum of Understanding (MOA) between the U.S. EPA, State of Idaho and Coeur d'Alene Tribe, October 29, 1992, all three parties recognize that each reserves all rights, powers and remedies by statute, treaty and otherwise. As derived from various legal and treaty remedies, the Coeur d'Alene Tribe retains its long standing claim in law over the bed and banks of Coeur d'Alene Lake.

Neither the Coeur d'Alene Lake Plan nor any action pursuant to the plan shall be construed as an admission by the Tribe as to the respective rights or legal authority of the Tribe with respect to Coeur d'Alene Lake's waters, bed or banks. This lake plan is intended to facilitate joint action and inter-governmental coordination among the parties, and neither creates any rights nor gives rise to any right of judicial review.

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GLOSSARY

aerobic: Describes life or processes that require the presence of molecular oxygen.

algae: Small aquatic plants lacking stems, roots, or leaves which occur as single cells, colonies, or filaments.

algal bloom: Rapid, even explosive, growth of algae on the surface of lakes, streams, or ponds.

anaerobic: Describes processes that occur in the absence of molecular oxygen.

anoxic: A condition of no oxygen in the water. Often occurs near the bottom of fertile lakes in the summer and under ice in the winter.

bathymetric map: A map showing the bottom contours and depths of a lake.

beneficial use: Any of the various uses which may be made of water, including, but not limited to, domestic water supplies, industrial and agricultural water supplies, recreation in and on the water, wildlife habitat, and aesthetics.

benthic: The bottom of lakes, stream or ponds.

best management practices: Accepted methods for controlling nonpoint source pollution; may include one or more conservation practices.

bioassay: A procedure used to test the effects on growth and survival of organisms exposed to a range of substances with nutritional or toxic effects.

biochemical oxygen demand (BOD): The rate of oxygen consumption by organisms during the decomposition of organic matter.

biomass: The weight of biological matter such as phytoplankton, macrophytes, or fish.

biota: All plant and animal species occurring in a specified area.

chlorophyll: The primary photosynthetic pigment in plants; often used as a measure of aquatic plant production.

coliform bacteria: A group of bacteria found in the colons of animals and humans, but also in natural soil and water where organic content is high. The presence of coliform bacteria in water is an indicator of possible pollution by fecal material.

decomposition: The transformation of organic material to inorganic material through biological and non-biological processes.

discharge: Outflow of water; related terms are runoff, streamflow, and yield.

dissolved oxygen: Molecular oxygen freely available in water and necessary for the respiration of aquatic life and the oxidation of organic materials.

dissolved oxygen depletion: The process in a lake whereby respiration and decomposition demands on oxygen are greater than the supply of dissolved oxygen generated from atmospheric reaeration and photosynthetic production.

drainage basin: The land area contributing runoff to a stream or other body of water; generally defined in terms of surface area. ie., square miles.

ecology: Scientific study of relationships between organisms and their environment.

ecosystem: A system of interrelated organisms and their physical-chemical environment.

epilimnion: Uppermost, warmest, well-mixed layer of a lake formed by summer thermal stratification. Extends from lake surface to thermocline depth.

environment: Collectively, the surrounding conditions, influences, and living and inert matter that affect a particular organism or biological community.

erosion: The wearing away of the landscape into smaller particles (sediment) by water, wind, ice, or gravity.

euphotic zone: The upper water column in a lake that receives enough sunlight so the photosynthetic carbon production by phytoplankton exceeds their respiratory needs.

eutrophic: Nutrient rich and generally referring to a fertile, productive body of water.

eutrophication: The natural process by which lakes and ponds become enriched with nutrients, resulting in increased growth of algae and reduced water clarity. If the process is accelerated by human activities it is termed cultural eutrophication.

floodplain: Land adjacent to lakes or rivers that is covered as water levels rise and overflow the normal water channels.

hardness: A property of water referring to the amount of dissolved minerals such as

calcium and magnesium. Increasing hardness tends to counteract the toxicity of some heavy metals.

hypolimnion: Lower, cooler layer of a lake. Extends from thermocline to lake bottom.

inorganic nitrogen: The sum of nitrite, nitrate, and ammonia nitrogen. The nitrogen most readily available as a nutrient for algae.

lake management: The practice of keeping lake quality in a state such that attainable uses can be achieved.

lake restoration: The act of bringing a lake back to its attainable uses.

limnetic zone: The open, deeper areas of a lake, exclusive of the shallow, shoreline areas.

limnology: Scientific study of fresh water, especially the history, geology, biology, physics, and chemistry of lakes.

littoral zone: The shallow areas of a lake adjacent to its shoreline and extending to the greatest depth occupied by rooted aquatic plants.

loading: The amount of a substance, usually nutrients or sediment, discharged past a point; expressed as weight per unit time.

macrophytes: Rooted and floating aquatic plants, commonly referred to as water weeds.

metalimnion: Layer of rapid temperature change in a thermally stratified lake. Located between the epilimnion and hypolimnion and contains the thermocline.

mesotrophic: Moderate nutrients and generally referring to a moderately fertile body of water.

model: A mathematical procedure, commonly executed on a computer, that mimics the functioning of a real system such as a lake and its contributing drainage basin.

morphometry: Relating to a lake's physical characteristics such as surface area, volume, maximum depth, and shoreline length.

nitrogen: An essential nutrient for aquatic organisms; comprises about 80 percent of the earth's atmosphere.

nonpoint source pollution: Pollution discharged from a wide land area, not from a specific point.

nutrient budget: Quantitative assessment of nutrients (usually nitrogen and phosphorus) moving into, being retained, and moving out of an ecosystem such as a lake.

nutrient loading: The addition of nutrients, usually nitrogen or phosphorus, to a water body.

nutrients: Elements or compounds essential to life, including but not limited to carbon, nitrogen, phosphorus, and trace elements.

oligotrophic: Nutrient poor and generally referring to an infertile, unproductive body of water.

orthophosphorus: The phosphorus ion most readily available as a nutrient for algae.

organic matter: Materials produced by plants and animals and containing linked carbon atoms and elements such as hydrogen, nitrogen, sulfur and phosphorus.

phosphorus: An essential nutrient for aquatic organisms, usually derived from weathered rock.

phytoplankton: Microscopic aquatic plants freely suspended in the water column.

point source pollution: Pollutants discharged from an identifiable point such as pipes, ditches, channels, sewers, tunnels and containers of various types.

pollution: Any alteration in the character or quality of the environment which renders it unfit or less suited for beneficial uses.

secchi disc transparency: The depth at which an 8-inch diameter black and white disc suspended in the water column is no longer visible from the water surface; a measure of water transparency.

sediment: Fragmented organic and inorganic material, removed by erosion and transported by water, wind, ice and gravity.

stormwater runoff: Surface water runoff, usually associated with urban development, which carries both natural and human-caused pollutants.

stratification: Layering of water caused by differences in water density. Thermal stratification is typical of most lakes during the summer; chemical stratification is less common.

thermocline: A horizontal plane across a lake at the depth of the most rapid vertical

change in temperature. By common definition, thermocline is formed when temperature decline is equal to or greater than 1 degree Celsius per meter of depth change.

trace elements: Elements which are required in minute amounts as nutrients; in excess they are often toxic. Often refers to heavy metals.

trophic state: Referring to the nutritional status of a water body and categorized as oligotrophic, mesotrophic and eutrophic.

wastewater: Treated or untreated sewage, industrial waste or agricultural waste.

water column: Water in the lake between the interface with the atmosphere at the surface and the interface with the sediment layer at the bottom.

water quality standard/criteria: Legally mandated and enforceable maximum contaminant levels of chemical, physical and biological parameters for water.

water quality: A term used to describe the chemical, physical and biological characteristics of water with respect to its suitability for a beneficial use.

wetlands: Lands where water saturation of the soil for at least part of the year is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the surrounding environment.

zooplankton: Small animals, often microscopic, that float freely in lake water and graze on detritus, bacteria and algae and are, in turn, consumed by fish.

DEFINITION OF ACRONYMS

Numerous acronyms are used throughout the document. They are defined as follows:

* ACOE, U.S. Army Corps of Engineers
* ACP, Agricultural Conservation Program
* ASCS Agricultural and Stablization Service
* BC, Benewah County
* BLM, U.S. Bureau of Land Management
* CAC, Citizen's Advisory Committee for CBIG,
* CBIG, Coeur d'Alene Basin Interagency Group
* CBRP, Coeur d'Alene Basin Restoration Project
* CES, Cooperative Extension Service, University of Idaho
* CLCC, Clean Lakes Coordinating Council
* CT, Coeur d'Alene Tribe
* DEQ, Idaho Division of Environmental Quality
* EPA, U.S. Environmental Protection Agency
* FG, Idaho Department of Fish and Game
* FPA, Idaho Forest Practices Act
* FPAAC, Forest Practices Act Advisory Committee
* ICL, Idaho Conversation League
* IDHW, Idaho Department of Health and Welfare
* IDL, Idaho Department of Lands
* DWR, Idaho Department of Water Resources
* IFC, Idaho Forestry Council
* ILA, Idaho Loggers Association
* IPR, Idaho Department of Parks and Recreation
* ITD, Idaho Department of Transportation
* IWR, Idaho Department of Water Resources
* KC, Kootenai County
* NIBCA, North Idaho Building Contractors Association
* NRCS, Natural Resource Conservation Service
* NRDA, Natural Resources Damage Assessment
* PAC, Panhandle Area Council
* PHD, Panhandle Health District
* AWQP, State Agricultural Water Quality Program
* SC, Shoshone County
* SCD, Soil Conservation Districts
* UI, University of Idaho
* USCG, U.S. Coast Guard
* USDA, U.S. Department of Agriculture
* USFS, U.S. Forest Service
* USFWS, U.S. Fish and Wildlife Service
* USGS, U.S. Geological Survey
* WPCA, Water Polution Control Account
* WWC, Waterways Commission
* WWP, Washington Water Power.

COEUR D'ALENE LAKE MANAGEMENT PLAN

EXECUTIVE SUMMARY

INTRODUCTION

The lake management study was initiated in 1991 in response to long-term concerns over water quality degradation. These concerns centered around increases in nutrients, which resulted in increased plant growth, decreased water clarity and heavy-metal contamination of lakebed sediments. The study was funded and conducted cooperatively by the U.S. Geological Survey, Idaho Division of Environmental Quality, and Coeur d'Alene Tribe. It had three objectives:

1) Determine the lake's ability to receive and process nutrients (phosphorus and nitrogen) in order to devise means to prevent declines in water quality;

2) Determine the potential for the release of heavy metals from lakebed sediments into the overlying lake water; and

3) Develop a lake management plan that will identify actions needed to meet water quality goals.

The agencies cooperating to develop the Lake Coeur d'Alene Management Plan sought to develop a comprehensive plan addressing water quality and non-water quality issues. A comprehensive treatment of water quality issues was developed, but recreational, access, aesthetic and use issues were not fully addressed. The body of this document is Part 1 of the plan addressing water quality. Part 2 of the plan requires further development although some action items addressing non-water quality problems were developed by the technical advisory groups who developed part 1 of the plan.

WATER QUALITY MANAGEMENT ZONES AND GOALS

Viewed as a whole, Coeur d'Alene Lake exhibits relatively high water quality. Yet both the study data and public and agency perceptions reveal specific geographical areas of concern and specific water quality problems. It is not appropriate to apply a single management strategy to the entire lake and watershed. Therefore, the lake has been divided into four water quality management zones. Each zone focuses on specific issues, goals, and management approaches pertinent to that zone. The four zones are:

1) **Nearshore** (water depths less than 20 feet)

2) **Shallow, southern lake** (south of the mouth of the Coeur d'Alene River and including the shallow lakes such as Benewah, Chatcolet, Hidden, and Round)

3) **Lower rivers** (lower reaches of the St. Joe and Coeur d'Alene Rivers that are affected by backwater from the lake)

4) **Deep, open water** (north of the mouth of the Coeur d'Alene River)

Water quality issues within the **nearshore management zone** include, but are not limited to: excessive growth of microscopic

aquatic plants attached to underwater materials (periphyton), excessive growth of large aquatic plants (macrophytes), bacterial contamination, protection of drinking water drawn from the lake, toxicity of heavy metals, and lake level fluctuations. Zinc levels in the water currently exceed levels identified by federal criteria as harmful to freshwater aquatic life.

Water quality issues within the shallow, **southern lake management zones** include, but are not limited to: depletion of dissolved oxygen, presence of high concentrations of heavy metals in the lakebed sediments, toxicity of heavy metals to aquatic life in the lakebed and lake water, sedimentation, reduced water clarity, and excessive growth of aquatic plants. The heavy metal concerns are restricted to the area north of Conkling Point. Zinc concentration exceeds criteria protective of aquatic life. Freshwater insects, fish, and animals that live in other areas of the lake are curtailed in much of the southern lake during the summer because of dissolved oxygen depletion.

Water quality issues within the **lower rivers management zone** include, but are not limited to: bank erosion, nutrient loading from nonpoint pollution sources, excessive growth of aquatic plants, and bacterial contamination. In the Coeur d'Alene River, heavy metal contamination of the riverbank sediments and water is very high; levels of zinc, cadmium, copper, and lead exceed levels identified as harmful for aquatic life by federal criteria. In addition, lead levels in the Coeur d'Alene River water exceed federal drinking water standards for humans; however, these criteria are applicable at the tap, not in the water body.

Water quality issues within the **deep, open water management zone** include, but are not limited to: depletion of dissolved oxygen in the summer, presence of high concentrations of heavy metals in the lakebed, and toxicity of heavy metals to aquatic life in the lakebed and lake water. Levels of zinc in the lake water exceed freshwater life criteria. Concentrations of cadmium, lead, and zinc in hypolimnetic water, exceed federal acute and/or chronic criteria for aquatic life.

In each of the four management zones, the public has chosen **the goal of "slow improvement in water quality."** Goals of "no action" or "maintain current water quality" were not legally acceptable because of state and federal water quality criteria and standards have been exceeded. The goal of "rapid improvement in water quality" was rejected because of implementation costs.

The environmental factors controlling phytoplankton algae production in lakes are numerous; nutrients, particularly phosphorus, have repeatedly been found to be major factors. Trace elements have infrequently been reported as significantly affecting phytoplankton production, either as a nutritional deficiency or as a toxicant. In the case of Coeur d'Alene Lake, the phytoplankton bioassays indicated that the biologically available, dissolved concentrations of zinc in the northern two-thirds of the lake exert a strong suppression on phytoplankton growth. Similar results were reported by two studies conducted on the lake in the early 1970's. These results raise an important issue for water quality management in Coeur d'Alene Lake: If zinc concentrations were reduced to comply with federal water quality criteria, would the

lake's phytoplankton production markedly increase? If the answer to the question is affirmative, then nutrient loadings would need to be reduced, perhaps significantly, in order to counteract the lifting of zinc's suppressive effect on phytoplankton production.

TRENDS IN LAKE WATER QUALITY

Despite the issues and concerns listed, Coeur d'Alene Lake's water quality has improved during the last 15-20 years. This positive trend is attributable to the enactment of environmental laws by federal, state, and local governments, and a growing societal awareness of environmental issues. Settling ponds for mining and smelting wastes were installed in the late 1960's and effective sewage treatment began in the Silver Valley in the mid-1970's and into the 1980's. State and local standards for subsurface sewage disposal were also made more stringent. State laws now require the use of best management practices (BMPs) for reducing water quality effects of timber harvest activities. Encouraged by economics, as well as by state and federal programs, agricultural practices that reduce erosion and sedimentation have also come into more widespread use. All of these factors, along with a growing environmental awareness and the transition to an economy less dependent on natural resources extraction, have contributed to the recent improving trend in water quality in Coeur d'Alene Lake.

Coeur d'Alene Lake has become visibly "cleaner" in recent years, but the potential exists for serious and widespread water quality degradation given present trends in population growth and lake use, coupled with the extent of past pollution. Significant depletion of dissolved oxygen still occurs in deep, bottom waters during the late summer. The shallow, southern lake area and several bays are becoming shallower because of sediment eroded from agricultural and timber lands as well as from nearshore areas being developed for residential and recreational uses. Southern lake waters are becoming infested with aquatic plants. Excessive growth of attached algae can be seen on shoreline rocks, docks, and boats in some nearshore areas. Sewage treatment facilities in the basin still contribute a significant portion of the lake's potentially controllable nutrient load. The bed and banks of the lower reaches of the Coeur d'Alene and St. Joe Rivers continue to be eroded and transport heavy loads of sediment and nutrients into the lake. Much of the bottom of the lake is blanketed with sediment containing high levels of heavy metals as well as substantial amounts of nutrients. Contaminated wastes from past mining in the Coeur d'Alene River drainage continue to flow into the lake in sizeable amounts. Perhaps the greatest threat to Coeur d'Alene Lake is the potential for reversal of the recent improvements in water quality. Such a reversal could be brought on by the rapid increases in lake use, population growth, and land development now occurring throughout the basin. Unless preventative measures are initiated soon, the recent improvements in lake water quality could be eroded or lost.

RECOMMENDED MANAGEMENT ACTIONS

The public was involved in the lake management planning process via its participation on the following five technical advisory groups (TAGs): forest practices, agriculture, development (with a recreation

subgroup), southern lake, and rivers. Each TAG considered water quality issues and management goals and then developed management actions to achieve those goals. About 80 people participated. They represented local, state and federal agencies, industry, environmental organizations, and community and business associations. The management actions developed by the TAGs were then applied to the appropriate water quality management zones.

Management goals for the **nearshore zone** is to be achieved with management actions developed by the TAGs for forest practices, agriculture, and development. The majority of these management actions involve application of BMPs to control erosion from small watersheds that feed the lake. Reductions will also be sought for nutrient inputs from nearshore domestic septic systems and municipal wastewater treatment plants.

Within the shallow, **southern lake zone**, management goals can be achieved by reducing the nutrient loads within the lakebed sediments, contributed by watersheds plus erosion of riverbanks and lakeshores. Mechanical harvesting can be employed to periodically remove nutrients contained in the abundant aquatic macrophytes which grow in this zone. Nutrient loads from contributing watersheds can be reduced by application of BMPs on agricultural and forested lands. Additional reductions can be gained by upgrading several municipal wastewater treatment plants that contribute nutrient loads to this zone. To reduce erosion of riverbanks and the lakeshores, the southern lake TAG suggests establishment of "no wake" zones and management of boat traffic within this zone.

The management goals for **the lower rivers zone** will be achieved by reducing accelerated riverbank erosion by **25 percent** in the St. Joe River and by **50 percent** in the Coeur d'Alene River over the next decade. After acquiring better knowledge on the location and severity of erosion, bank stabilization projects can be undertaken, probably with assistance from the Army Corps of Engineers. Educational materials will be developed to inform boat operators of ways they can reduce their negative impacts on riverbanks. Landowners will be informed of riverbank stabilization methods they can employ which have been approved by the Corps of Engineers.

The deep, **open water zone** integrates the water quality effects of natural and human influences throughout the basin. Management goals for this zone will be achieved partially by management actions undertaken within the other three zones; however, the majority of the lake's nutrient loading comes from the Coeur d'Alene and St. Joe River basins. Within these two basins, important management actions to be implemented include erosion control from forested lands and reductions in nutrient loadings from municipal wastewater treatment plants. Formation of a lake basin commission is suggested as a means to coordinate the diverse, incremental efforts that will be required to achieve the long-term goals of the lake management plan.

Numeric Values for current, desired, and criteria/standards-based water quality conditions in the deep, **nearshore management zone.**

	Desired Condition[11]	Current Condition[1]	Standard or Recommended Level[10]
Dissolved Oxygen (mg/L)[2]	8.6	8.6	6.0[3]
Total P (μg/L)(ppb)[2]	5-10	5.0[8]	25.0
Zinc (μg/L)(ppb)[2]	32.7	56	32.7
Clarity (Secchi depth meters)	7.6	7.6[4]	none
Coliform bacteria	500/100 ml	-	500/100 ml[5]
	200/100 ml	-	200/100 ml[6]
	50/100 ml	-	50/100 ml[7]

1. Average condition of 19 bays unless otherwise noted.
2. Seven-day average.
3. Standard applies to all waters except the lowest 7 meters of the water column at depths greater than 35 meters.
4. Average of 19 bays 7.6 meters; worst case Fuller's 5.2 meters.
5. At any time.
6. In no more than 10% of the samples taken over a 30 day period.
7. Geometric mean of samples taken over a 30 day period.
8. Average total phosphorus for 19 bays over two years; worst case, Kidd Island Bay, 16 μg/L.
9. Average of 19 bays; worst case Kidd Island Bay, 150/100ml.
10. Standard based Idaho Water Quality Standards and wastewater treatment requirements, EPA "Gold Book" criteria (as interpreted by National Toxic Rule) or phosphorus levels recommended to prohibit nucience aquatic weed growth.
11. Based on interpretation of Idaho Antidegradation policy and special resource waters designation of Lake Coeur d'Alene.
12. Trace (heavy) metals criteria are based on the hardness (mg/L $CaCO_3$) of the waterbody for which it is applied. The criteria is calculated as a function of the exponential of the logarithm of the hardness value. The National Toxic Rule and proposed Idaho water quality standards for metals operate in a hardness range of 25 to 400 mg/L $CaCO_3$ (Federal Register 57: 246, 1/22/92, 60917). The zinc goal developed for drafts of the Coeur d'Alene Lake Management Plan was calculated to be 18.4 μg/L based on the incorrect use of the lake hardness which averages 19 mg/L. Based on the National Toxics Rule, under which Idaho is currently listed, and proposed Idaho water quality standards, the criteria should be calculated at a hardness of 25 mg/L $CaCO_3$. The correct zinc criteria is 32.7 μg/L.

Numeric Values for current, desired, and criteria/standards-based water quality conditions in the shallow, **southern-lake management zone.**

	Desired Condition[6]	Current Condition[1]	Standard or Recommended Levels
Dissolved Oxygen (mg/L)[2]	8.4	8.4	6.0
Total P (μg/L)[2]	12.0	18.3[4]	25.0[5]
Zinc (μg/L)(ppb)[2,3]	32.7	39.0	32.7
Clarity (Secchi depth meters)	4.0	3.0	none

1. Average of Chatcolet and Blue Point Stations unless otherwise noted.
2. Seven-day average.
3. Applies to area of southern lake north of Conkling Point.
4. Average total phosphorous = 18.3 μg/L; worst case Chatcolet Lake 26.9 μg/L.
5. Standard based on Idaho water quality standards and wastewater treatment requirements, EPA "Gold Book" criteria (as interpreted by National Toxic Rule) or phosphorus levels recommended to prohibit nucience aquatic weed growth.
6. Based on interpretation of Idaho Antidegradation policy and special resource water designations of Lake Coeur d'Alene.

Numeric Values for current, desired, and criteria/standards-based water quality conditions in the deep, **open-water management zone.**

	Desired Condition[9]	Current Condition[1]	Standard or Recommended Level[8]
Dissolved Oxygen (mg/L)[2]	7.0	7.0	6.0[3]
Total P (μg/L)(ppb)[2]	9.0	9.0	25.0
Zinc (μg/L)(ppb)[2]	32.7	143	32.7
Clarity (Secchi[2] depth meters)	6.0	6.0[4]	none
Coliform bacteria	500/100 ml	-	500/100 ml[5]
	200/100 ml	-	200/100 ml[6]
	50/100 ml	-	50/100 ml[7]

1. Average of values of Tubbs Hill, Wolf Lodge, Driftwood and University Point Stations.
2. Seven-day average.
3. Standard applies to all waters except the lowest 7 meters of the water column at depths greater than 35 meters.
4. Worst case during winter runoff at University Point, Station 1.0 meters.
5. At any time.
6. In no more than 10% of the samples taken over a 30 day period.
7. Geometric mean of samples taken over a 30 day period.
8. Standard based on Idaho water quality standards and wastewater treatment requirements EPA "Gold Book" criteria (as interpreted by National Toxic Rule) or phosphorus levels recommended to prohibit nucience aquatic weed growth.
9. Based on interpretation of Idaho Antidegradation policy and special resource water designation of Lake Coeur d'Alene.

COEUR D'ALENE LAKE ASSESSMENT

INTRODUCTION

Coeur d'Alene Lake, Idaho's second largest, is located in northern Idaho within the 6,680 square miles (17,300 square kilometer) Spokane River drainage basin (fig. 1). The lake has become a prime recreational site for northern Idaho and eastern Washington because of its beautiful setting and proximity to the cities of Spokane (1990 population of about 362,000) and Coeur d'Alene (1990 population of about 25,000). Extensive residential and commercial development in its drainage basin and shoreline, plus intensive recreational use of Coeur d'Alene Lake have created considerable concern over the potential for nutrient enrichment and subsequent eutrophication of the lake.

A nutrient loading study done in 1975 classified Coeur d'Alene Lake as mesotrophic, or moderately productive, and recommended that additional studies of the sources and magnitudes of nutrient loadings be performed prior to development of a lake management plan (U.S. Environmental Protection Agency, 1977). Coeur d'Alene Lake has also been the recipient of trace-element-enriched mining and smelting wastes that were produced over 100 years by mining and ore-processing activities in the Coeur d'Alene River drainage basin. Studies in the early 1970's (Funk and others, 1973, 1975) found high concentrations of trace elements in the lakebed sediments in the northern two-thirds of the lake.

Eutrophication and the deposition of trace elements in Coeur d'Alene Lake may appear to be unrelated water quality problems. However, large quantities of trace elements and nutrients can be released from lakebed sediments into the overlying water if eutrophication increases the lake's hypolimnetic dissolved oxygen deficits. Oxygen deficits were measured in Coeur d'Alene Lake in 1979 (Rieman, 1980) and 1987 (Woods, 1989). The trace elements in the lakebed of Coeur d'Alene Lake probably cannot be removed in an economically or environmentally-sound manner; therefore, the principal means of keeping the metals in the lakebed is to manage the lake's nutrient income to curtail development of anaerobic conditions.

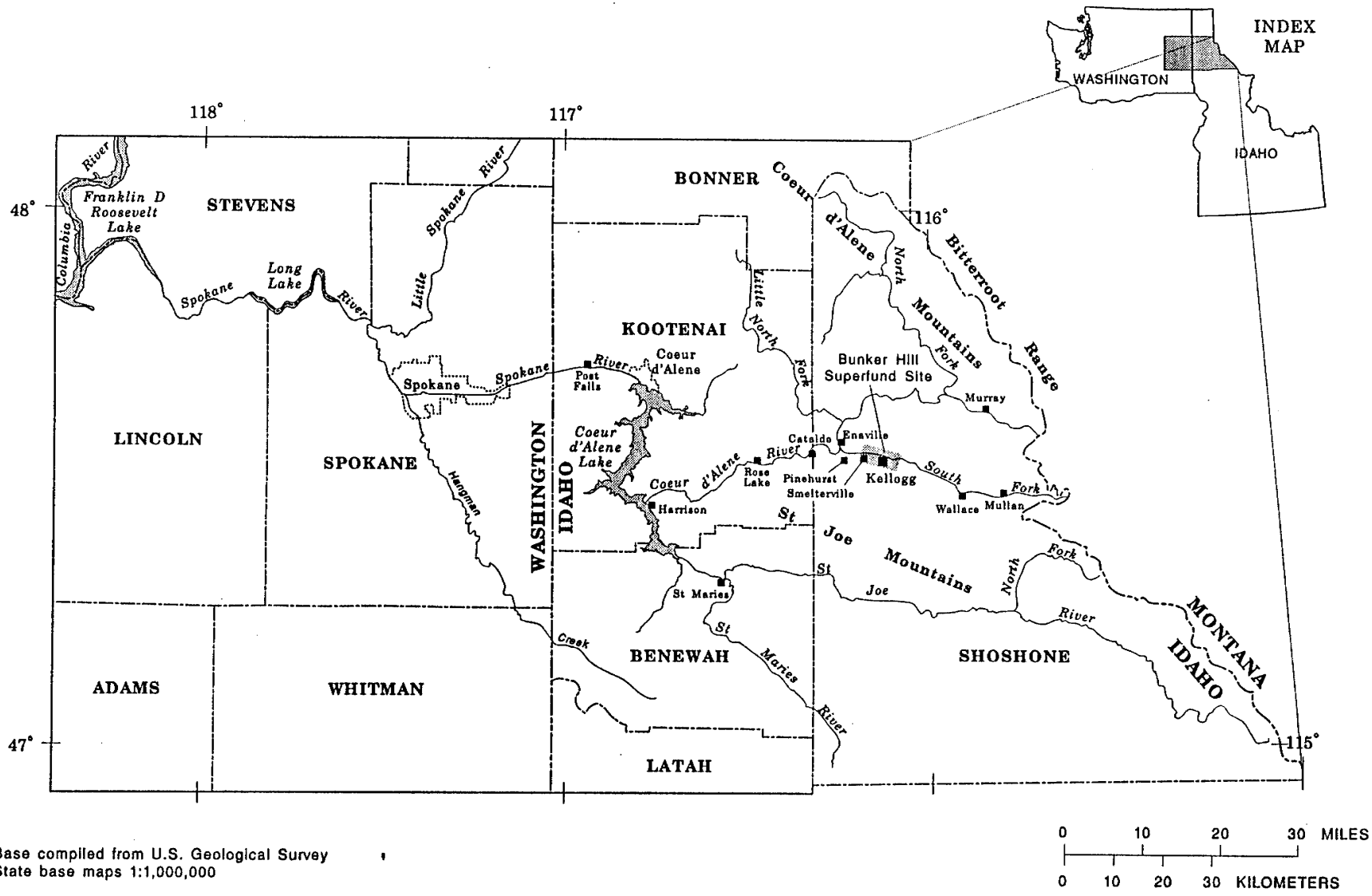
Idaho's recently enacted Nutrient Management Act requires that a nutrient management plan be developed for Coeur d'Alene Lake. The Act requires the plan to:

1) identify nutrient sources;

(2) identify the dynamics of nutrient removal, use, and dispersal; and

(3) identify preventative or remedial actions where feasible and necessary to protect surface water.

The Idaho Department of Health and Welfare, Division of Environmental Quality was given responsibility for development of the nutrient management plan. They requested assistance from the U.S. Geological Survey for development of the data base necessary to produce the management plan. The Coeur d'Alene Tribe also requested assistance from the U.S. Geological Survey to advise them on the status of eutrophication in the southern end of the lake. Therefore, a cooperatively-funded study of the lake was conducted during 1991-93 by the U.S. Geological Survey, Division of Environmental Quality, and the Coeur d'Alene



Base compiled from U.S. Geological Survey
State base maps 1:1,000,000

Figure 1. Location of Coeur d'Alene Lake, northern Idaho.

Tribe. The major results of the study are summarized later in this report.

Development of the lake management plan began upon completion of the lake study. A lake management plan workgroup was formed in early 1993. It has used the results of the lake study to guide the plan's overall development.

The workgroup is composed of representatives from Idaho Division of Environmental Quality, Coeur d'Alene Tribe, U.S. Geological Survey, Clean Lakes Coordinating Council (CLCC), Coeur d'Alene Basin Restoration Project, and commissioners from Benewah, Kootenai, and Shoshone Counties. Public input to the plan was received through a series of public meetings and reviews by citizen-staffed technical advisory groups. The results of those endeavors have resulted in this document, the Coeur d'Alene Lake Management Plan.

The goal of the management agencies was to develop a Lake Coeur d'Alene Management Plan which addressed water quality as well as non-water quality issues. Part 1 of the plan would address water quality issues, while Part 2 would focus on issues of recreation, access, aesthetics and general use. The plan presented is a water quality plan for the lake. The action items addressing non-water quality issues, developed primarily by the recreation technical advisory groups, have been retained in appendix C. These action items will form a starting point for development of a comprehensive plan addressing the numerous recreation, access, aesthetics and use issues.

DESCRIPTION OF LAKE AND ITS WATERSHED

PHYSICAL ATTRIBUTES

The 3,980 square miles (10,310 square kilometer) study area is located within Benewah, Kootenai, and Shoshone Counties in northern Idaho and Spokane County in eastern Washington (fig. 1). . The Bitterroot Range composes the majority of the study area. The Range is characterized by high, massive mountains mantled with coniferous forests and deep, intermountain valleys. Elevations range from approximately 2,000 feet (610 meters) above sea level at the Idaho-Washington state line to 6,844 feet (2,086 meters) at the Idaho-Montana border. Coeur d'Alene Lake has a surface elevation of 2,128 feet (648.7 meters) at full pool. The lake's two principal tributaries are the Coeur d'Alene and St. Joe Rivers which drain the Coeur d'Alene and St. Joe Mountains, subsets of the Bitterroot Range. The lake is drained by the Spokane River, a tributary to the Columbia River.

The Coeur d'Alene and St. Joe Mountains are primarily metasedimentary rocks of the Proterozoic Belt Supergroup which have been locally intruded by granitic rocks of Cretaceous age. The lower elevations to the west of the Coeur d'Alene and St. Joe Mountains are underlaid by glaciofluvial deposits and remnants of multiple basaltic lava flows. An important feature in the northwest part of the study area is the Rathdrum Prairie Aquifer, a 409 square mile (1,060 square kilometer) valley-fill aquifer created during the Pleistocene by repeated outburst floods from glacial Lake Missoula.

A generalized description of the major soil types in the study area was derived from U.S. Department of Agriculture (1984). The majority of the mountainous area east of Coeur d'Alene Lake contains soils on mountainsides, formed in volcanic ash and loess over metasedimentary rocks. The mountainous area west of the lake and north of Windy and Rockford Bays contains soil on mountainsides formed in volcanic ash and loess over granite, gneiss, and schist.

Much of the hilly margin of the lake contains two major soil types. The first are soils on undulating to steep hills, formed in deep loess with some volcanic ash influence. The second type are soils on mountainous slopes and canyon walls associated with hills and plateaus; they are formed mainly in basalt with a thin loess cover.

The Rathdrum Prairie Aquifer has soils on glaciated mountainsides, glacial moraines, and associated terraces, formed in volcanic ash overlaying glacial drift and in sandy glacial lake-laid sediments. The lower river valleys of the St. Joe and Coeur d'Alene Rivers contain soils on floodplains and low terraces, formed in silty alluvium.

The study area receives some of the largest amounts of precipitation in Idaho. About 70 percent of the annual precipitation occurs as snow during October to April. The areal distribution of precipitation is influenced by the basin's topography. For example, the climatological station at Coeur d'Alene (elevation; 2,159 feet, 658 meters) has a mean annual precipitation of 25.4 inches (644 millimeters), whereas the station at Wallace (elevation; 2,940 feet, 896 meters) receives 38.3 inches (971 millimeters). Ambient temperature varies throughout the study area depending on elevation; at Coeur d'Alene, the mean annual temperature is 9.1 degrees Celsius. Although winter temperatures at Coeur d'Alene Lake are often below freezing, in recent decades the lake normally does not freeze except in its shallow southern end.

Coeur d'Alene Lake lies in a naturally-dammed river valley. The lake's outflow is controlled by Post Falls Dam which provides hydroelectric power, flood control, and irrigation supply. At its outlet, the lake receives surface water inflow from 3,741 square miles (9,690 square kilometers). At its normal full pool elevation of 2,128 feet (648.7 meters) above sea level, the lake covers 49.8 square miles (129 square kilometers) and contains 0.67 cubic miles (2.8 cubic kilometers) (table 1). At full pool, the lake's mean depth is 72.2 feet (22 meters) and its maximum depth is 209 feet (63.7 meters). When the lake level is reduced to an elevation of 2,120 feet (646.2 meters), the limit of usable capacity, the surface area is reduced to 47.1 square miles (122 square kilometers) and the volume to 0.62 cubic miles (2.6 cubic kilometers). A bathymetric map of Coeur d'Alene Lake has recently been published by the Geological Survey (Woods and Berenbrock, 1994); a page-size version of that map is illustrated in figure 2. The southern end of the lake contains four shallow lakes, Benewah, Chatcolet, Hidden, and Round, which were flooded in 1906 by impoundment of the Spokane River and Coeur d'Alene Lake by Post Falls Dam.

The Coeur d'Alene River (drainage area; 1,472 square miles, 3,812 square kilometers) discharges into the lake near Harrison. The river has three major reaches, the North Fork, the South Fork, and the reach downstream of the two Forks. Land-use activities within the

Table 1. Morphometric data for Coeur d'Alene Lake at full-pool elevation of 648.6 meters

[km^2, square kilometers; km^3, cubic kilometers; m, meters]

Surface area, in km^2	129
Volume, in km^3	2.84
Shoreline length, in m	243
Maximum depth, in m	63.7
Mean depth, in m	22.0

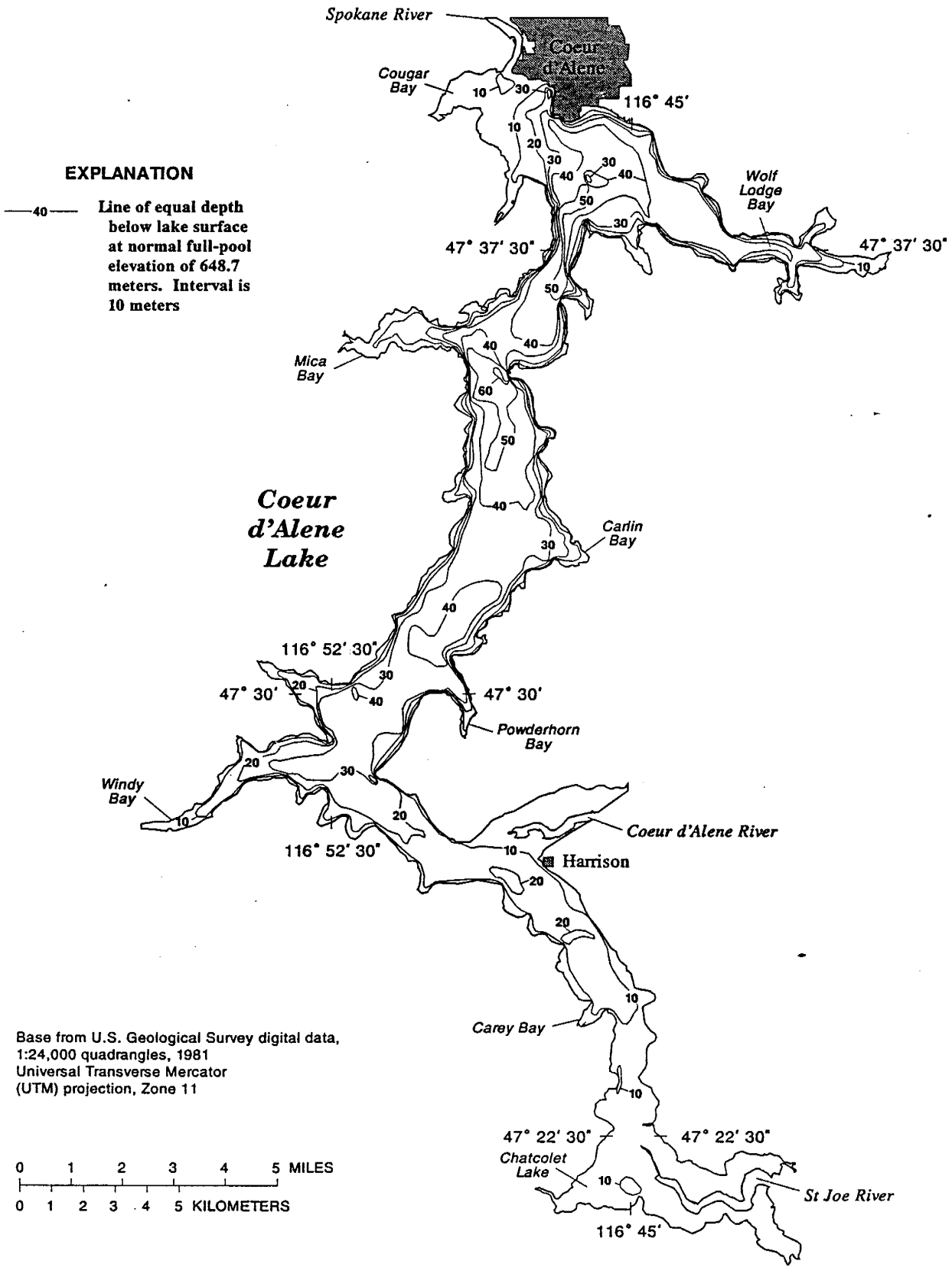


Figure 2. Bathymetric map of Coeur d'Alene Lake.

Coeur d'Alene River basin include recreation, logging, agriculture, mining and ore processing. The majority of the mining and ore processing activities are located in the South Fork Basin which contains the Bunker Hill Superfund Site.

The St. Joe River (drainage area; 1,745 square miles, (4,520 square kilometers) discharges into the southern end of the lake. The St. Joe River is joined by the St. Maries River at the city of St. Maries. Recreation and logging are the dominant land uses; very little mining activity has occurred in the St. Joe River basin.

BIOLOGICAL ATTRIBUTES

Historically, the native fish species abundant in Coeur d'Alene Lake and its tributaries included west slope cutthroat trout, bull trout, mountain whitefish, northern squawfish, peamouth, suckers, and sculpins (Coeur d'Alene Tribe, written commun., 1994). In 1937, kokanee salmon were introduced, beginning the lake's transformation to a sport fishery dominated by introduced species. Other introduced species include: chinook salmon, rainbow trout, brook trout, northern pike, yellow perch, tench, black bullhead, pumpkin seed, largemouth bass, smallmouth bass, and black crappie (Coeur d'Alene Tribe, written commun., 1994).

The extensive forests of the watershed support deer, elk, moose, black bear, coyote, bobcat, cougar, porcupine, squirrel, marten, badger, wolverine, beaver, mice and other small rodents, several species of songbirds, forest grouse, owls, hawks and other raptors, as well as many species of amphibians, reptiles, insects and other invertebrates.

The mainly coniferous forests are composed of firs, pines, hemlocks, cedar, and larch. Deciduous trees such as cottonwood, alder and willow are found along lakeshores and streambanks, or interspersed among the conifers as are isolated stands of aspen and birch. Many species of grasses, mosses, fungi, and deciduous shrubs blanket the forest floor or grow in open areas.

The region's numerous wetlands and nearshore areas also support an abundance of plant, animal, and bird life. Waterfowl such as Canada geese and several species of ducks are abundant year round, and large numbers, including less common species such as swans and snow geese pass through the area seasonally during migration. Many species of songbirds, water birds, and raptors are also common. These areas also support otter, beaver, muskrat, weasels and other furbearers.

LAND USE AND LAND COVER

The land use and land cover within the study area were classified using remote sensing technology. The classification was performed by the Idaho Department of Water Resources. under contract to the U.S. Geological Survey; their report (Idaho Department of Water Resources, 1993) describes the methods and results and, therefore, will only be summarized here.

Two Landsat TM scenes were classified; they represented recent summer scenes with less than 10-percent cloud cover. Scene 42/27 is a full scene acquired on July 21, 1989. Scene 43/27 is a subscene acquired on July 27, 1989. The scenes were geocoded to a UTM projection and were then blended together to produce a single scene. The total RMS error of the final scene was 16.5 meters. An unsupervised classification approach was selected because of the complexity of the study

area. Image processing and image interpretation procedures were used to produce the following list of 15 land use and land cover classes:

* dense urban or built-up land
* sparse urban or built-up land
* irrigated agriculture and pasture
* dryland agriculture and pasture
* rangeland
* deciduous forest
* coniferous forest
* sparse forest
* recent clearcuts
* recovering clearcuts
* water
* wetlands
* barren land
* mined land
* clouds and cloud shadows

An accuracy assessment was conducted to determine individual class accuracies as well as overall accuracy. The overall accuracy for the classification was 96 percent.

The study area was subdivided into 40 subbasins (fig. 3 and table 2) to provide detailed information on land use and land cover. The subbasins contiguous to Coeur d'Alene Lake comprised 27 of the subbasins. The Coeur d'Alene River's drainage basin was divided into seven subbasins whereas the St. Joe River's was subdivided into five units. The remaining subbasin represented the area between the lake's outlet and the U.S. Geological Survey's gaging station near the Idaho-Washington state line. The detailed breakdown (of land use and land cover for the 40 subbasins) is listed in Idaho Department of Water Resources (1993).

The land use and land cover within the 3,980 square miles (10,310 square kilometer) study area (table 3) is dominated by coniferous forest (51.6 percent) and sparse forest (23 percent). The two agriculture classes represent 5.4 percent of the area whereas recent and recovering clearcuts represent 6 percent. Wetlands represent only 0.23 percent of the land use and land cover. The Idaho Department of Parks and Recreation (1993) has recently published a priority listing of wetland areas. The list gives priority consideration to wetlands that 1) provide a high degree of public benefits, 2) are representative of rare or declining wetland types within an ecoregion, and 3) are subject to an identified threat of loss or degradation. Within the border of Coeur d'Alene Lake, there are the following eleven priority wetland areas:

* Wolf Lodge Bay/Beauty Bay
* St. Joe River levees and delta
* Benewah Lake
* Cougar Bay
* Blue Creek Bay
* Mica Bay
* Kid Island Bay
* Loffs Bay
* Rockford Bay
* Windy Bay
* Highway 95 bridge over Coeur d'Alene Lake

SOCIOECONOMIC CONDITIONS

Until recently, the Coeur d'Alene region's economy depended on its abundant natural resources; however, beginning in the 1980's, the mining and timber industries were in economic decline. Tourism became a component of the region's economy in the 1950's as the region's scenic beauty, high

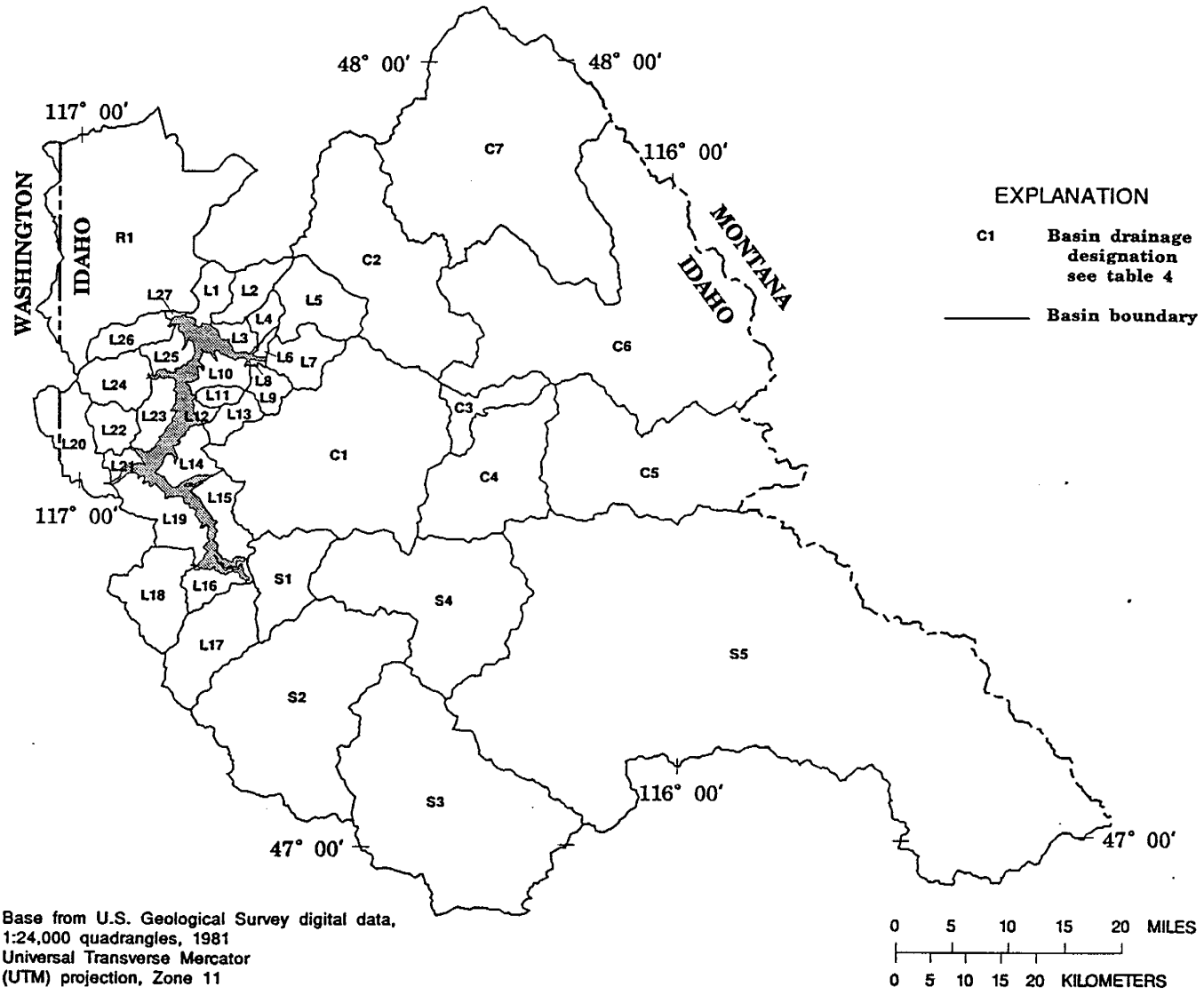


Figure 3. Locations of 40 subbasins within study area.

Table 2. Subbasins and associated drainage areas in the study area

[km², square kilometer; L, Lake; C, Coeur d'Alene River; S, St. Joe River; R, Spokane River; USGS, U.S. Geological Survey]

Subbasin No. (fig. 3)	Subbasin name	Drainage area (km²)	Subbasin No. (fig. 3)	Subbasin name	Drainage area (km²)
L1	City of Coeur d'Alene	37.1	L27	Cougar Bay, nearshore, northwest	2
L2	Fernan Creek	49.5	C1	Coeur d'Alene River, Harrison to Cataldo gaging station	652
L3	Bennett Bay, nearshore	18.9	C2	Coeur d'Alene River, Little North Fork	445
L4	Blue Creek	20.5	C3	Coeur d'Alene River, Enaville gaging station	67.1
L5	Wolf Lodge Creek	104	C4	Coeur d'Alene River, South Fork, Pinehurst to Elizabeth Park gaging station	270
L6	Wolf Lodge Bay, nearshore, northeast	5.4	C5	Coeur d'Alene River, South Fork, Elizabeth Park gaging station	482
L7	Cedar Creek	62.5	C6	Coeur d'Alene River, South Fork, Pinehurst to North Fork, Enaville to Prichard gaging station	1,020
L8	Wolf Lodge Bay, nearshore, southeast	1.7	C7	Coeur d'Alene River, North Fork, upstream from Prichard gaging station	876
L9	Beauty Creek	28.9	S1	St. Joe River, lake to St. Maries gaging station	117
L10	Squaw Bay to Echo Bay, nearshore	34.2	S2	St. Maries River, St. Maries to Santa gaging station	565
L11	Turner Creek	16.5	S3	St. Maries River, upstream from Santa gaging station	713
L12	Carlin Bay, nearshore	7.2	S4	St. Joe River, St. Maries to Calder gaging station	438
L13	Carlin Creek	31.7	S5	St. Joe River, upstream from Calder gaging station	2,687
L14	Powderhorn Bay, nearshore	44.3	R1	Spokane River, lake outlet to USGS gaging station near State line	624
L15	Harrison to St. Maries, nearshore	54.9			
L16	Chatcolet Lake, nearshore, south	34.3			
L17	BenewahEnaville Creek	138			
L18	Plummer Creek	114			
L19	Windy Bay to Chatcolet Lake, nearshore	79.9			
L20	Lake Creek	99.5			
L21	Windy Bay, nearshore, north	14.1			
L22	Fighting Creek	41.6			
L23	Rockford Bay to Mica Bay, nearshore	41.9			
L24	Mica Creek	67.7			
L25	Mica Bay to Cougar Bay, nearshore	29.6			
L26	Cougar Creek	48.5			

Table 3. Land use and land cover in the study area

[km², square kilometers]

Land use and land cover classification	Area (km²)	*Percent* of total
Coniferous forest	5,260	51.6
Sparse forest	2,350	23.0
Rangeland	688	6.8
Clouds	402	3.9
Recovering clearcut forest	385	3.8
Dryland agriculture and pasture	357	3.5
Recent clearcut forest	227	2.2
Irrigated agriculture and pasture	196	1.9
Water	166	1.6
Dense urban or built-up land	48.9	.48
Cloud shadows	34.6	.34
Sparse urban or built-up land	29.1	.29
Wetland	23.9	.23
Barren land	15.2	.15
Deciduous forest	7	.07
Mined land	4.1	.05
TOTAL (rounded)	10,200	100

quality water resources and abundant outdoor recreation opportunities drew increasing numbers of visitors (Kootenai County Planning Commission, 1993). As the natural resource industrial base declined, tourism, recreation, and associated service and sales businesses became the region's new growth industries. Tourism could be the region's largest industry by the year 2000 (Panhandle Area Council, 1993).

The population dynamics of North Idaho and its five counties (Benewah, Bonner, Boundary, Kootenai, and Shoshone) have been evaluated for the period 1970 to 1990 (Panhandle Area Council, 1993). During that period, North Idaho's population grew 54 percent (82,300 to 126,600) with the largest increase during the 1970's. Bonner and Kootenai Counties experienced the most growth, whereas Shoshone County lost population, particularly during the 1980's. Projections call for as much as 10 percent growth during the 1990's (Panhandle Area Council, 1993).

About 76 percent of the population of the Coeur d'Alene watershed resides in Kootenai County, primarily in the cities of Coeur d'Alene, Post Falls, Hayden, and their immediate vicinities. Kootenai County also contains large portions of the forested and agricultural lands in the watershed. The county also contains a significant portion of the watershed's wetland, especially at the heads of lake bays, along the Coeur d'Alene River, and around the ten shallow lakes adjacent to the river's lower reach.

The county's population has increased by 136 percent over the last thirty years, to 69,795, as reported in the 1990 census. The largest increase occurred during the 1970's (table 4). Some current forecasts predict Kootenai County to grow as much as 20 percent during the 1990's (Kootenai County Planning Commission, 1993; Panhandle Area Council, 1993). Considering tourists in hotels/motels and part-time residents of second homes, the peak population of Kootenai County may exceed 100,000 in the summer (Kootenai County Planning Commission, 1993). Much of the direct recreational use of Coeur d'Alene Lake and associated tourist-related business occurs in Kootenai County.

The city of Coeur d'Alene (1990 population of about 25,000) is becoming a major year-round tourist destination. In 1993, total hotel-motel and lodging sales in Kootenai County amounted to over $27 million, based on stated travel and convention room tax receipts. This figure represents at least a fourfold increase over the last decade (Idaho Department of Commerce, 1992; Idaho Department of Employment, 1993). The county also contains most of the lakeshore homesites which are increasingly becoming year round residences. The total 1991 market value of all property in Kootenai County was estimated to be over $2.3 billion (Idaho Department of Commerce, 1992), with property on (or immediately nearby) Coeur d'Alene Lake accounting for over half that figure (Kootenai County Assessor, written commun., 1993).

Shoshone County is the largest of the three counties making up the Coeur d'Alene Lake basin. It contains much of the rural, mountainous, and forested lands, including the headwater areas of the Coeur d'Alene and St. Joe Rivers. It also contains the Coeur d'Alene Mining District (the Silver Valley). The county's population (about 15.2 percent of the basin's total) has declined by about 29.3 percent since 1970 (table 4). Significant timber harvest and some remaining mining

Table 4. Population of Benewah, Kootenai, and Shoshone Counties, 1890–1990

Population assessment year	Benewah County	Kootenai County	Shoshone County
1890	([1])	4,108	5,382
1900	([1])	10,216	11,950
1910	([1])	22,247	13,936
1920	6,977	17,878	14,250
1930	6,371	19,469	19,060
1940	7,332	22,283	21,230
1950	6,173	24,947	22,806
1960	6,036	29,556	20,876
1970	6,230	35,332	19,718
1980	8,292	59,770	19,226
1990	7,937	69,795	13,931

[1]Benewah County was combined with Kootenai County until 1915.

activities occur in Shoshone County.

Although Shoshone County's economy has not fully recovered from the decline of the mining industry, diversification efforts are underway (Panhandle Area Council, 1993). The city of Kellogg is developing a major mountain resort to attract skiers and sightseers. Hotel-motel and lodging sales in Shoshone County amounted to $1.8 million in 1991, or about three times that of 1983 (Idaho Department of Commerce, 1992). This trend is expected to continue as plans to develop tourism based on the Silver Valley's mining history are pursued (Hudson, Jelaco, Welch, Comer, 1993). Environmental cleanup and mine restoration technology and services may also emerge as an industry in the future.

Benewah County is the smallest in both area and population of the three counties comprising the Coeur d'Alene Lake basin (table 4). It was part of Kootenai County until 1915. While its population increased 27.8 percent from 1970 to 1990, the county actually declined 4.3 percent during the 1980's, possibly related to recent declines in the timber industry (Panhandle Area Council, 1993). Benewah County contains much of the productive agricultural land in the basin.

Forested areas in the lower St. Joe and St. Maries River drainages support extensive timber harvest. Major forest products processing mills are located in the county. St. Maries is as the county seat and a major transhipment point for logs. Many are towed down the St. Joe River and across the lake to mills in Coeur d'Alene. Benewah County has one of the largest sources of placer-mined industrial and gem grade garnets in the nation. The county is also becoming a major producer of wild rice from wetlands and flooded fields along the lower St. Joe and St. Maries Rivers. Heyburn State Park, one of the largest and most heavily used in the state is in the county. However, the recreation/tourism business potential of the county remains largely undeveloped (Harris and others, 1989).

The Coeur d'Alene Tribal aboriginal homeland covered almost five million acres in what is now northern Idaho, eastern Washington and western Montana. The heart of this homeland is the Coeur d'Alene Basin, including both river and Coeur d'Alene Lake. The Tribe's presence here dates to time immemorial. Until the coming of European culture and eventual reduction of Coeur d'Alene lands to the current reservation, the Tribe enjoyed a vast wealth of natural resources. Almost everything Tribal members needed--wildlife, fish, water potatoes, huckleberries, camas root and other food sources--was easily at hand. These natural resources were and are essential to maintaining tribal culture and customs. History shows that tribal members camped along the banks of the lake and traveled along its tributaries and ridges via canoe, horseback and by foot. Archeological digs reveal encampments from the northern shore of Lake Pend Oreille to the Spokane Valley, then south and across the existing state line to the upper St. Joe River valley. These encampments represented scores of families and bands, all part of the Coeur d'Alene Tribe.

The existing 1,400 square mile Coeur d'Alene Indian Reservation was established in 1891, encompassing parts of Benewah and Kootenai Counties. It includes only a small portion of the original 4,000,000 acres that was the traditional homeland of the Coeur d'Alene Indians. Under the Indian Reorganization Act of 1934, the Tribal Council was formally

recognized as the ruling body of the Coeur d'Alene Tribe; a governing Constitution was approved and adopted by the Tribe in 1947.

The Tribe has evolved into an economic force in northern Idaho with expanding Tribal commercial, health and environmental programs which are self-determined and self-governed. Of the approximately 6,000 residents within the reservation boundaries, only 750 are Coeur d'Alene Tribal members (about 550 other tribal members live outside of the reservation).

The major communities within the reservation boundary include a part of the Benewah County seat of St. Maries plus Plummer, Worley, Tensed and DeSmet. Tribal headquarters are located near Plummer. The tribe operates farming, logging, construction, retail businesses, a school system and a health care facility (Coeur d'Alene Tribe, written communication, 1994). The tribe recently constructed and is operating a bingo hall near Worley, and is exploring other tourism, recreation and service enterprises.

Of the 345,000 acres that comprise the reservation, about 58,000 acres are in Indian ownership. About 197,000 acres of the reservation drain into Coeur d'Alene Lake. Approximately one-third of Coeur d'Alene Lake lies within the Coeur d'Alene Indian Reservation, but the Coeur d'Alene Tribe does not own or control any lakeshore frontage. West and southwest of the lake, the reservation is dominated by agricultural uses on very fertile but highly erosive Palouse soils. In contrast, the reservation's east side is largely timber producing land. The natural world and all that are in it are paramount to Coeur d'Alene Tribal culture and heritage. The stewardship of the basin's environmental remain a critical issue of tribal government.

LAKE USES

Coeur d'Alene Lake is heavily used for recreational boating and fishing. Although Kootenai County contains only 6.9 percent of Idaho's boatable water, 18.5 percent of the state's boats are registered in the county. This number increased by almost 62 percent in the last five years, from 12,800 in 1988 to 20,800 in 1992 (U.S. Bureau of Land Management, 1993). A large number of Coeur d'Alene Lake boaters are from outside the state. Of the 10,000 out-of-state boat registrations in Idaho, a little over half of the owners declare Benewah and Kootenai Counties as their primary area of use; out-of-state boaters account for about one-fourth of the 20,000 boats registered in Kootenai County (Idaho Department of Parks, written commun., 1993).

Coeur d'Alene Lake is probably the region's major attraction as a recreation and tourist area. A large lakeshore resort in Coeur d'Alene continues to expand, especially after the addition of a golf course on the site of a former sawmill on the city's eastern edge. Many public and private recreation areas, ranging from simple boat launch ramps to campgrounds, picnic areas, and interpretive trails, are also located on the lake (table 5). A recent recreation management plan describes in greater detail the characteristics and services offered at each site (U.S. Bureau of Land Management, 1993). The cities of Coeur d'Alene, Harrison, Post Falls, and St. Maries operate popular parks offering picnic and/or camping facilities and water access for boating and/or swimming.

Within a 50 mile (80 kilometer) radius of the city of Coeur d'Alene are numerous lakes that

Table 5. Public and private recreation facilities at Coeur d'Alene Lake

[D, docks; T, toilets; DW, drinking water; BR, boat ramp; C, camping; RS, rental boat slips; data from Bureau of Land Management, 1993]

Facility name	Services available
Public	
North Idaho College beach	D, T, DW
Third Street beach	BR, D, T, DW
Boothes Park	BR, D, T
I–90 boat launch	BR, D
Higgins Point	D
Wolf Lodge Bay	BR, D, T
Squaw Bay	BR, D, T
Turner Point	D, T
Turner Bay	D, T
Carlin Bay	BR, D
Bell Bay	D, T, DW, C
Harlow Point	D
Mowry State Park	D, T, C
Windy Bay	D, T, C
Sun Up Bay	BR, D, T
Rockford Bay	BR, D, T
Loffs Bay	BR, D, T
Mica Bay boat park	D, T, C
Mica Bay	BR, D, T
Goulds Landing	BR, D, T
Rocky Point Marina	D, T, DW, BR, RS
Chatcolet, day use	D, T, BR
Plummer Point	D, T, DW
Howleys Landing	D, T, DW, C
Private	
Boardwalk Marina	D, RS
Yacht Club Sales	BR, T, DW, RS
Northwest Resort	BR, T, DW, RS
Silver Beach Resort	D, RS
Delevans Marine	RS
Wolf Lodge campground	T, DW, C
Coeur d'Alene Lake Resort	D, T, DW, C
Beauty Bay Resort	D, RS
Squaw Bay Resort	BR, D, T, DW, C, RS
Panhandle Yacht Club	RS
Arrow Point RV Park	T
Arrow Point Resort	D, T, DW
Carlin Bay Resort	D, T, DW, C
Conklin Park Marina	D, T, DW, BR, RS

Table 6. Lakes within an 80-kilometer radius of the city of Coeur d'Alene

[km^2, square kilometer; —, no data available]

Lake name	Surface area (km^2)	Lake name	Surface area (km^2)
Idaho lakes		**Idaho lakes—Continued**	
Anderson[1]	1.2	Pend Oreille	330
Black[1]	1.4	Porter	.1
Blue[1]	.8	Rose[1]	1.4
Bull Run[1]	.3	Round	.2
Cave[1]	2.4	Spirit	5.2
Chilco	—	Swan[1]	1.5
Fernan	1.4	Thompson[1]	.8
Granite	.1	Twin	7.8
Hauser	2.4	**Washington lakes**	
Hayden	17		
Kelso	.2	Liberty	2.8
Killarney[1]	1.9	Long Lake	21
Medicine[1]	.7	Newman	4.9

[1]Lateral lakes adjacent to Coeur d'Alene River.

offer recreation opportunities similar to those available at Coeur d'Alene Lake (table 6). By far, the largest is Lake Pend Oreille, the southern end of which is within the 50 mile (80 kilometer) radius. The majority of these lakes are accessible by car; only a few of the lateral lakes adjacent to the Coeur d'Alene River are restricted to boat access only.

In 1991 the Idaho Department of Fish and Game conservatively estimated the gross economic value of the Coeur d'Alene Lake fishery at $6 million. The kokanee fishery contributed almost half, while chinook salmon and spiny rays (which included the "trophy" pike fishery) contributed approximately $225,000 and $330,000, respectively (Coeur d'Alene Tribe, written commun., 1994).

Coeur d'Alene Lake is a source of water for agricultural, domestic, and industrial use. At least six public water supply systems use the lake water, including, until recently, the city of Coeur d'Alene. The Idaho Department of Water Resources records 220 water rights filed to withdraw water from Coeur d'Alene Lake (Idaho Department of Water Resources, written commun., 1993). Although environmental and public health agencies advise against using surface water for domestic purposes without extensive treatment, many of these permitted withdrawals serve as a drinking water source. There are many more unpermitted withdrawals, some of which are also probably used for domestic purposes (Ken Lustig, Panhandle Health District, oral commun., 1993).

SUMMARY OF 1991-93 LAKE STUDY

OBJECTIVES

The objective of the lake study was to determine the lake's assimilative capacity for nutrients to assess the potential for development of an anoxic hypolimnion and the consequent release of nutrients and trace elements from the lakebed sediments. Seven major tasks were undertaken to achieve the two objectives:

(1) assess physical, chemical, and biological characteristics in the limnetic and littoral zones of the lake;

(2) quantify loadings of water, nutrients and selected trace elements into and out of the lake;

(3) develop a nutrient load/lake response model of the lake;

(4) using the model, simulate responses of the dissolved oxygen deficit to alterations in nutrient loadings;

(5) perform geochemical analyses of lakebed sediments to determine concentration, partitioning, and environmental availability of selected trace elements;

(6) characterize land cover/land use throughout the study area using remote sensing and GIS techniques; and

(7) assemble the data base needed for development of a lake management plan.

The results of the study are discussed in reports by Idaho Department of Water

Resources (1993), Berenbrock and Woods (1994), Horowitz and others (1993, 1994), Kuwabara and others (1994), Woods (1994), and Woods and Beckwith (in press); a summarization follows.

LIMNOLOGY

- Numerous measurements were taken in the lake's open-water (fig. 4) and nearshore areas (fig. 5) to assess the lake's physical, chemical, and biological characteristics.

- Water-column transparency was measured as an index of the lake's biological production. The lake's southern area was less transparent than the central and northern areas (fig. 6), indicating that the southern area was more productive.

- The nutrients nitrogen and phosphorus are important determinants of aquatic plant growth. The amounts of both nutrients were larger in the lake's southern area (tables 7 and 8), indicating a larger pool of nutrients was available for biological production.

- Phosphorus was the nutrient most likely to control the rate of aquatic plant growth because it was in shortest supply relative to the nutritional requirements of the plants (table 9).

- Chlorophyll is an important index of biological production in lakes because it is the pigment aquatic plants use for photosynthesis. The amount of chlorophyll was largest in the southern area of the lake (table 10), indicating a larger potential for biological production.

- Measurements of water-column transparency, nitrogen, phosphorus, and chlorophyll are used worldwide by lake scientists to assess and compare the biological production of lakes (table 11). For Coeur d'Alene Lake, these measurements were typical of oligotrophic, or low productivity lakes (table 12).

- The amount of oxygen dissolved in the deeper areas of a lake can become depleted if the lake is overly productive of aquatic plants. During the majority of the study, Coeur d'Alene Lake had abundant dissolved oxygen. However, the southern area of the lake was severely depleted of dissolved oxygen during the late summer. The northern half of the lake also experienced depletion of dissolved oxygen during the late summer when the lower depths contained about 50 percent of the normal expected amount of dissolved oxygen.

- The large aquatic plants (macrophytes) were mapped to aid in identification of nearshore areas with abundant inputs of nutrients. The southern area of the lake had the most extensive beds of macrophytes, although Cougar Bay, in the northern area, was also heavily populated with macrophytes. The majority of bays with sedimentary deltas at their heads also contained abundant growths of macrophytes.

- Algae during the summer. The microscopic aquatic plants (phytoplankton) throughout most of the lake were essentially devoid of blue-green algae, which are often associated with highly productive lakes. However, the phytoplankton in the lake's southern area contained at least 10 percent blue-green algae.

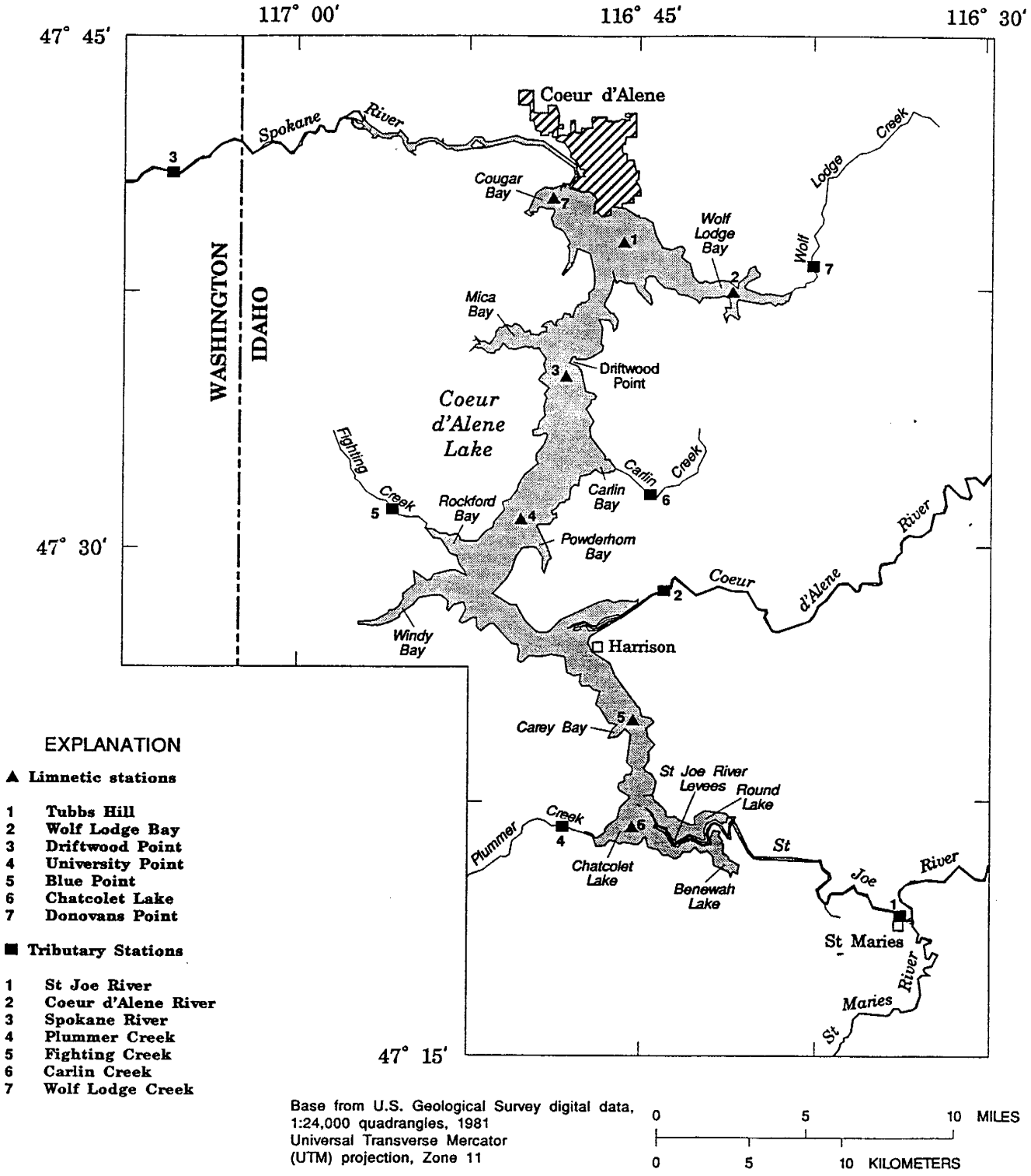


Figure 4. Locations of limnetic and tributary sampling stations.

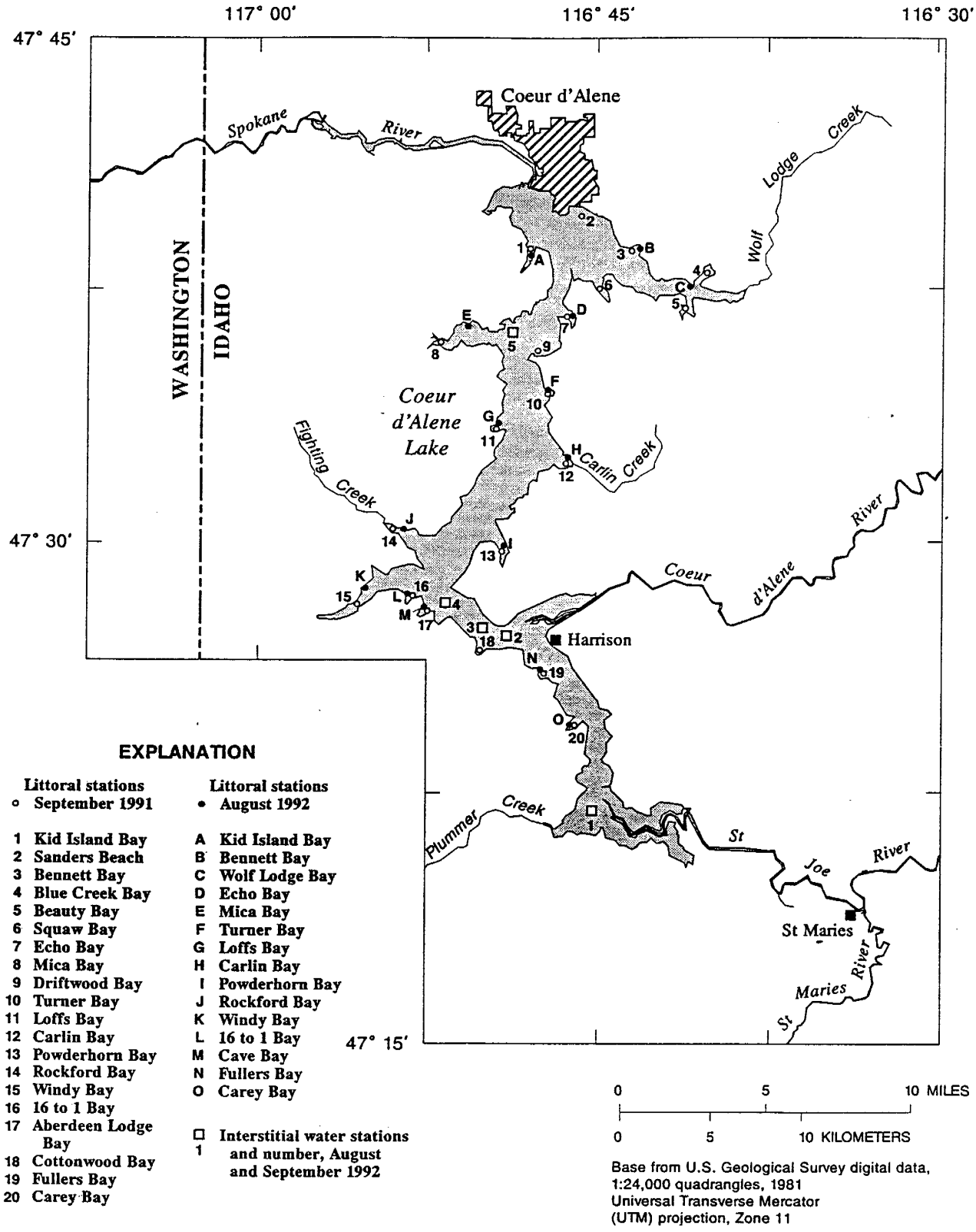


Figure 5. Locations of littoral sampling stations, September 1991 and August 1992, and interstitial water sampling stations, August and September 1992.

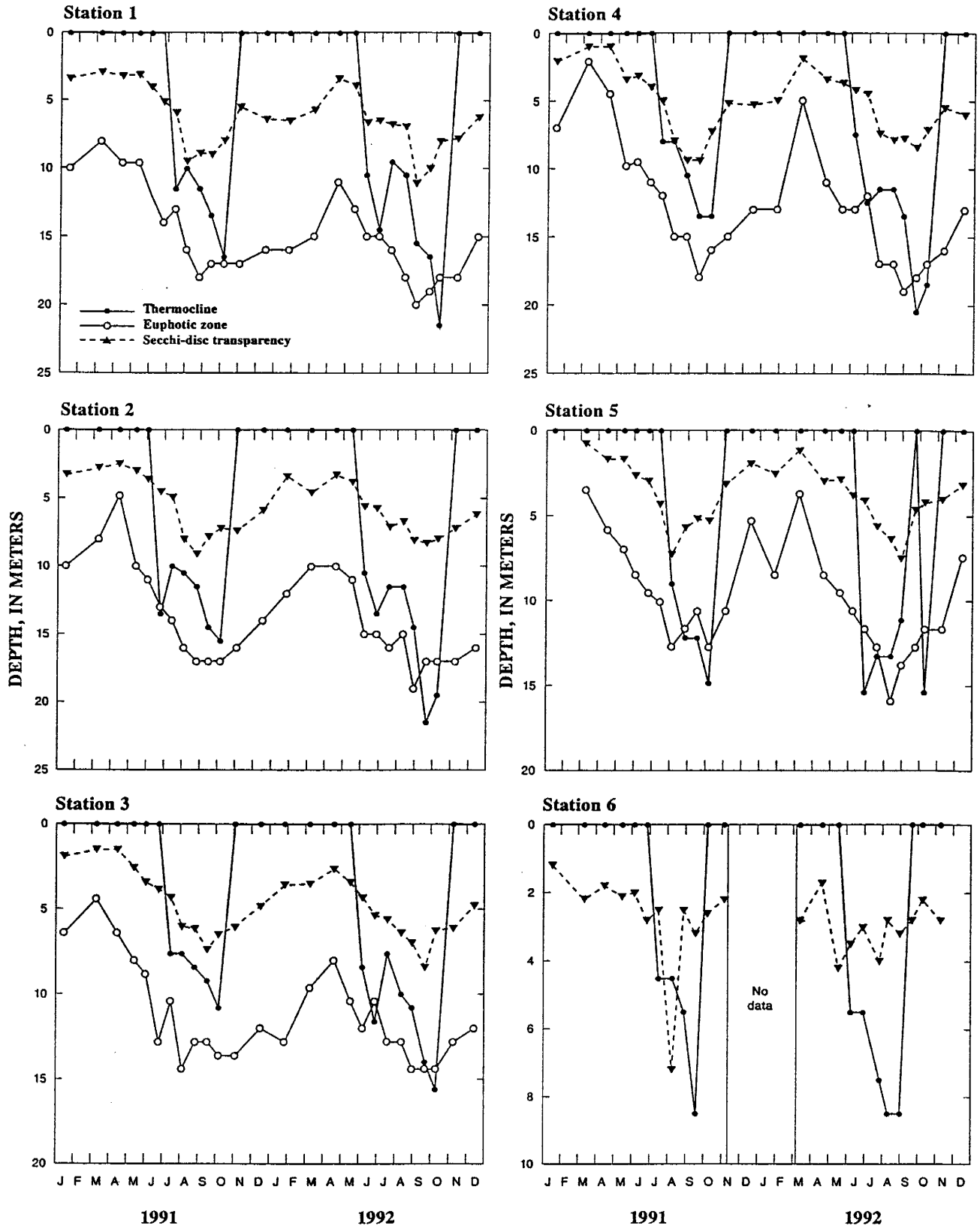


Figure 6. Depths of thermocline, euphotic zone, and secchi-disc transparency at stations 1–6 during 1991–92.

Table 7. Means and ranges of concentrations of total phosphorus and dissolved orthophosphorus in samples from the euphotic zone and near-bottom water at six limnetic stations and lakewide, Coeur d'Alene Lake, 1991–92

[µg/L, micrograms per liter; n, number of samples; <, less than]

Limnetic station	Total phoshporus (µg/L)						Dissolved orthophosphorus(µg/L)					
	Euphotic zone			Near bottom			Euphotic zone			Near bottom		
(fig. 4)	Mean[1]	Range	n	Mean[1]	Range	n	Mean[1]	Range	n	Mean[1]	Range	n
					1991							
1	5.2	1–16	13	4.9	<1– 12	13	1	<1– 1	13	2	<1– 5	12
2	4.4	2–10	13	4.9	<1– 8	12	1.2	<1– 3	13	1.6	<1– 4	12
3	4.6	1– 6	13	4.8	2– 6	13	1	<1– 2	12	1.3	<1– 3	13
4	5.6	<1– 9	13	6.2	3– 10	13	1.2	<1– 2	13	1.5	<1– 3	13
5	8.8	4–17	12	10.1	<1– 21	12	2.3	<1– 7	11	2.3	<1– 7	12
6	14.2	7–41	12	42.1	12–192	8	2.7	<1–11	12	13.6	<1–100	9
Lakewide	6.5	1–41	76	8.1	<1–192	71	1.4	<1–11	74	2.4	<1–100	71
					1992							
1	2.4	<1– 6	13	2.5	<1– 4	13	1	<1– 1	13	1.1	<1– 2	12
2	3.8	<1–10	12	4.8	<1– 25	13	1.1	<1– 2	12	1.6	<1– 8	13
3	2.9	<1–13	13	2.8	<1– 8	13	1.4	<1– 6	13	1.1	<1– 2	13
4	4.2	<1– 8	13	3.7	<1– 8	13	1	<1– 1	12	1.4	<1– 4	13
5	5.0	<1–13	12	5.8	<1– 15	12	1.4	<1– 5	12	1.9	<1– 7	12
6	5.2	<1– 8	9	10.0	7– 17	8	1	<1– 3	9	2.1	<1– 4	8
Lakewide	3.7	<1–13	72	3.8	<1– 25	72	1.2	<1– 6	71	1.3	<1– 8	71

[1]Mean computed by assigning detection limit value to less-than values.

Table 8. Means and ranges of concentrations of total nitrogen and dissolved inorganic nitrogen n samples from the euphotic zone and near-bottom water at six limnetic stations and lakewide, Coeur d'Alene Lake, 1991–92

[µg/L, micrograms per liter; n, number of samples; <, less than; LW, lakewide]

Limnetic station	Total nitrogen (µg/L)						Dissolved inorganic nitrogen (µg/L)					
	Euphotic zone			Near bottom			Euphotic zone			Near bottom		
(fig. 4)	Mean[1]	Range	n	Mean[1]	Range	n	Mean[1]	Range	n	Mean[1]	Range	n
					1991							
1	289	<205–427	13	349	244–631	11	38.3	<7–161	13	102	43–141	13
2	267	<205–409	13	309	229–481	13	32.8	<7–101	13	87.2	35–229	13
3	292	<205–616	13	375	249–902	13	42.2	9–117	13	94.4	30–137	13
4	309	<205–805	13	337	241–887	13	43.3	<7–104	13	102	43–131	13
5	329	<205–808	12	279	<205–459	12	36.6	11–117	12	54.8	14–137	12
6	365	<205–821	12	402	<205–833	8	45.8	8–234	12	84.6	<7–332	9
LW	307	<205–821	76	290	<205–902	70	41.9	<7–234	76	70.8	<7–332	73
					1992							
1	211	<205–221	13	265	222–340	13	19.7	<7–58	13	74.6	28–144	13
2	212	<205–239	12	240	<205–281	13	20.4	<7–47	12	48.7	<6–86	13
3	216	<205–257	13	274	224–316	13	23.2	<7–66	13	84.9	27–123	13
4	220	<205–270	13	273	<205–333	13	27.9	9–76	13	81.7	19–141	13
5	219	<205–287	12	238	<205–334	12	28.0	<7–98	12	50.2	16–153	12
6	206	<205–216	9	258	<205–607	8	15.0	<7–31	9	21.8	<7–48	8
LW	216	<205–287	72	256	<205–607	72	23.8	<7–98	72	56.7	<6–153	72

[1]Mean computed by assigning detection limit value to less-than values.

Table 9. Means and ranges of ratios of dissolved inorganic nitrogen to dissolved orthophosphorus in samples from the euphotic zone at six limnetic stations and lakewide, Coeur d'Alene Lake, 1991–92

[means and ranges in micrograms per liter; LW, area-weighted lakewide value]

Limnetic station (fig. 4)	Ratio		No. of samples
	Mean	Range	
	1991		
1	38.3	7–161	13
2	30	7–101	13
3	35	9– 81	12
4	38.3	7–104	13
5	20.3	7– 54	11
6	17.1	8– 39	12
LW	34.4	7–161	74
	1992		
1	19.7	7– 58	13
2	19.8	7– 47	12
3	22.8	1– 66	13
4	28.5	9– 76	12
5	20.4	7– 45	12
6	12.8	6– 31	9
LW	22.7	1– 76	71

Table 10. Means and ranges of chlorophyll-*a* concentrations in samples from the euphotic zones at six limnetic stations and lakewide, Coeur d'Alene Lake, 1991–92

[µg/L, micrograms per liter; <, less than; LW, lakewide]

Limnetic station (fig. 4)	Chlorophyll-*a* (µg/L)		No. of samples
	Mean[1]	Range	
	1991		
1	0.5	0.1–1	13
2	.5	.2–1.1	13
3	.4	.3–1	13
4	.5	<.1–1	13
5	.6	.3–1.4	12
6	.8	.1–2	11
LW	.5	<.1–2	75
	1992		
1	.6	<.1–1.3	12
2	.8	.4–1.4	11
3	.7	.2–1.2	13
4	.7	.2–1.5	13
5	.9	.2–1.7	13
6	1.1	.1–2.6	11
LW	.8	<.1–2.6	73

[1]Mean computed by assigning detection limit to less-than values.

Table 11. Trophic-state classification based on open-boundary values for four limnological variables

[Modified from Ryding and Rast (1989); µg/L, micrograms per liter; m, meter]

Limnological variable[1]		Oligotrophic	Mesotrophic	Eutrophic
Total phosphorus (µg/L)	$\bar{\chi}$	8.0	26.7	84.4
	$\bar{\chi} \pm 1$ SD	4.8–13.3	14.5–49.0	48.0–189.0
	$\bar{\chi} \pm 2$ SD	2.9–22.1	7.9–90.8	16.8–424.0
Total nitrogen (µg/L)	$\bar{\chi}$	661	753	1,875
	$\bar{\chi} \pm 1$ SD	371–1,180	485–1,170	861–4,081
	$\bar{\chi} \pm 2$ SD	208–2,103	313–1,816	395–8,913
Chlorophyll-*a* (µg/L)	$\bar{\chi}$	1.7	4.7	14.3
	$\bar{\chi} \pm 1$ SD	0.8–3.4	3.0–7.4	6.7–31.0
	$\bar{\chi} \pm 2$ SD	0.4–7.1	1.9–11.6	3.1–66.0
Secchi-disc transparency (m)	$\bar{\chi}$	9.9	4.2	2.4
	$\bar{\chi} \pm 1$ SD	5.9–16.5	2.4–7.4	1.5–4.0
	$\bar{\chi} \pm 2$ SD	3.6–27.5	1.4–13.0	0.9–6.7

[1] Annual geometric mean values and standard deviations.

Table 12. Trophic state of Coeur d'Alene Lake at six limnetic stations and lakewide during 1991 and 1992 based on annual mean values of four limnological variables

[µg/L, micrograms per liter; m, meters; TS, trophic state; O, oligotrophic; M, mesotrophic; E, eutrophic; LW, lakewide]

Limnetic station (fig. 4)	Total phosphorus (µg/L)		Total nitrogen (µg/L)		Chlorophyll-*a* (µg/L)		Secchi-disc transparency (m)	
	[1] $\bar{\chi}$	TS	[1] $\bar{\chi}$	TS	[1] $\bar{\chi}$	TS	[2] $\bar{\chi}$	TS
				1991				
1	4.2	O	275	O	0.39	O	5.3	M
2	3.9	O	259	O	.45	O	4.9	M
3	4.3	O	276	O	.39	O	4.7	M
4	5.0	O	282	O	.38	O	4.0	M
5	8.3	O	290	O	.52	O	3.1	M
6	12.4	O	316	O	.55	O	2.4	M/E
LW	5.6	O	282	O	.43	O	4.0	M
				1992				
1	2.0	O	211	O	.54	O	6.6	M
2	2.8	O	212	O	.71	O	5.6	M
3	2.1	O	215	O	.62	O	6.2	M
4	3.6	O	219	O	.62	O	5.2	M
5	3.7	O	218	O	.81	O	4.6	M
6	4.6	O	206	O	.79	O	2.9	M/E
LW	2.9	O	214	O	.67	O	5.1	M
				1991–92				
LW	4.1	O	247	O	.54	O	4.5	M

[1] Annual geometric mean concentration within euphotic zone.
[2] Annual geometric mean value.

- The microscopic aquatic plants attached to underwater materials (periphyton) were studied in nine bays to determine if the level of nearshore and watershed development was related to growth rates of periphyton. A strong and positive relation (coefficient of determination = 88.4) was statistically derived between growth rate of periphyton and the amount of phosphorus in the nearshore water and the percentage of agricultural land in the contributing watershed.

- The amount of the trace elements arsenic, cadmium, copper, mercury, and lead in the lake water was very low, whereas, the amount of zinc in the lake water was elevated throughout the northern two-thirds of the lake (table 13). Based on U.S. Environmental Protection Agency criteria, the zinc levels were potentially harmful to freshwater aquatic life (table 14), but not to humans.

- Algal bioassay tests for zinc toxicity indicated that the biologically-available, dissolved zinc concentrations in the northern two-thirds of the lake suppressed the growth of phytoplankton isolated from Coeur d'Alene Lake.

LAKEBED SEDIMENTS

- The phosphorus content of the lakebed sediments was slightly enriched whereas nitrogen was moderately enriched.

- The lakebed sediments in about 85 percent of the lake were markedly enriched in antimony, arsenic, cadmium, lead, mercury, and zinc (table 15). The area of the lake south of Conkling Point was not enriched in trace elements.

- The source of the trace-element enrichment was attributed to the mining, ore-processing, and smelting operations that have occurred since the 1880's in the Coeur d'Alene River watershed. The vast majority of the trace elements were associated with materials operationally defined as iron oxides, not sulfides as previously believed, and thus were quite likely to exist in a dissolved, not particulate, form if the lakebed contained little or no oxygen.

HYDROLOGIC, NUTRIENT, AND TRACE-ELEMENT BUDGETS

- Streamflow into the lake during 1991 was 130 percent of the long-term average, whereas, in 1992, streamflow was only 60 percent of average.

- The lake received over 90 percent of its water inflow from the St. Joe and Coeur d'Alene Rivers, with the St. Joe having the largest inflow (tables 16 and 17).

- During 1991 and 1992, the lake received over one-half of its phosphorus from the St. Joe and Coeur d'Alene Rivers, with the St. Joe as the largest contributor (tables 18 and 19).

- Phosphorus inputs in 1991 were about 2.5 times larger than those in 1992 because of the much larger streamflows of 1991.

- The lake received more phosphorus than it output to the Spokane River, thus, it acted as a trap for phosphorus.

- During 1991 and 1992, the lake received about three-fourths of its nitrogen from the St. Joe and Coeur d'Alene Rivers, with the St. Joe as the largest contributor (tables 18 and 19).

Table 13. Lakewide concentrations of six trace elements in samples from the euphotic zone and lower hypolimnion, Coeur d'Alene Lake, 1991–92

[µg/L, micrograms per liter; <, less than]

Trace element	Concentration (µg/L)		*Percent of samples below detection limit*	No. of samples
	Range	Median		
Arsenic, total	<1–1	<1	94.5	145
Cadmium, total recoverable	<1–2	<1	97.3	146
Copper, total recoverable	<1–15	1.6	40.0	136
Lead, total recoverable	<1–41	3.3	26.7	146
Mercury, total recoverable	<0.1–1.8	<1	79.3	145
Zinc, total recoverable	<10–390	98.6	11.0	146

Table 14. Concentrations of selected trace elements considered acutely or chronically toxic to freshwater biota based on hardness-dependent criteria

[µg/L, micrograms per liter; CMC, criterion maximum concentration; CCC, criterion continuous concentration; e, base of natural logarithms; ln, natural logarithm; H, hardness, in milligrams per liter as $CaCO_3$; —, data not available; mg/L, milligrams per liter]

Trace element	Criteria	Toxicity equation[1,2]	Concentration (µg/L)	
			Total recoverable	Dissolved
Arsenic	CMC	None	360	342
	CCC	None	190	180
Cadmium	CMC	$e^{[1.128(\ln H)-3.878]}$	.71	.60
	CCC	$e^{[0.7852(\ln H)-3.49]}$	.35	.30
Copper	CMC	$e^{[0.9422(\ln H)-1.464]}$	4.3	3.7
	CCC	$e^{[0.8545(\ln H)-1.465]}$	.16	.14
Lead	CMC	$e^{[1.273(\ln H)-1.46]}$	11.9	6.0
	CCC	$e^{[1.273(\ln H)-4.705]}$	.5	.12
Mercury	CMC	None	2.4	2.0
	CCC	None	.012	—
Zinc	CMC	$e^{[0.8473(\ln H)+0.8604]}$	32.4	27.5
	CCC	$e^{[0.8473(\ln H)+0.7614]}$	29.4	25.0

[1] From U.S. Environmental Protection Agency (1986).

[2] Hardness is median value for Coeur d'Alene Lake, 1991–92, 22 mg/L as $CaCO_3$.

Table 15. Statistical summary of selected trace elements in surficial and subsurface lakebed sediments in enriched and unenriched areas, Coeur d'Alene Lake

[mg/kg, milligrams per kilogram; S, surficial sample; C, subsurface sample; <, less than; data from Horowitz and others (1993, 1995)]

Trace element	Sample type	Concentration for enriched area (mg/kg)				Median concentration for unenriched area[1] (mg/kg)
		Minimum	Maximum	Mean	Median	
Arsenic	S	2.4	660	151	120	4.7
	C	3.5	845	103	30	12
Cadmium	S	<.5	157	62	56	2.8
	C	<.1	137	25	26	.3
Copper	S	9	215	72	70	25
	C	20	650	91	60	30
Lead	S	14	7,700	1,900	1,800	24
	C	12	27,500	3,200	1,250	33
Mercury	S	.02	4.9	1.8	1.6	.05
	C	<.01	9.9	1.9	0.95	.06
Zinc	S	63	9,100	3,600	3,500	110
	C	59	14,000	2,400	2,100	118

[1]Unenriched area median concentration for sample type S based on 17 samples from southern area of Coeur d'Alene Lake and lower reach of St. Joe River. Unenriched area median concentration for sample type C based on 189 sample aliquots from cores beneath enriched area.

Table 16. Hydrologic budget and errors associated with each budget component, Coeur d'Alene Lake, 1991

[Volumes and errors are in cubic hectometers]

Budget component	Inflow or outflow		Error
	Volume	Percent of total	
Inflow			
St. Joe River	3,350	52.4	502
Coeur d'Alene River	2,610	40.8	391
Plummer Creek	22	.3	1.6
Fighting Creek	10.5	.2	.8
Carlin Creek	8.5	.2	.6
Wolf Lodge Creek	57	.9	4.3
Ungaged surface-water inflow	260	4.1	68
Wastewater	6.2	.1	1.5
Precipitation	64.6	1.0	9.7
Outflow			
Evaporation	93.3	1.5	24.6
Ground-water outflow to Rathdrum Prairie	205	3.1	51.2
Lake storage change	33.6	.06	2.5
Spokane River	6,270	94.8	470
Summary			
Total inflow	6,390		
Total outflow	6,610		
Residual (outflow - inflow)	220		
Overall error	796		

Table 17. Hydrologic budget and errors associated with each budget component, Coeur d'Alene Lake, 1992

[Volumes and errors are in cubic hectometers]

Budget component	Inflow or outflow		Error
	Volume	Percent of total	
	Inflow		
St. Joe River	1,660	52.0	300
Coeur d'Alene River	1,280	40.1	200
Plummer Creek	11.4	.4	.9
Fighting Creek	5.5	.2	.4
Carlin Creek	4.5	.1	.3
Wolf Lodge Creek	21.9	.7	1.6
Ungaged surface-water inflow	125	3.9	34
Wastewater	5.5	.2	1.4
Precipitation	75	2.4	11
	Outflow		
Evaporation	98.3	2.8	24.6
Ground-water outflow to Rathdrum Prairie	205	5.8	51.2
Lake storage change	54.3	1.6	4.1
Spokane River	3,140	89.8	236
	Summary		
Total inflow	3,190		
Total outflow	3,500		
Residual (outflow - inflow)	310		
Overall error	436		

Table 18. Nutrient budgets and errors for total phosphorus and total nitrogen, Coeur d'Alene Lake, 1991

[Loads and errors are in kilograms]

Budget component	Total phosphorus			Total nitrogen		
	Load	Percent of total	Error	Load	Percent of total	Error
Inflow						
St. Joe River	72,100	54.3	11,000	1,040,000	45.9	155,000
Coeur d'Alene River	22,000	16.6	3,120	801,000	35.3	121,000
Plummer Creek	2,060	1.6	180	38,000	1.7	3,460
Fighting Creek	610	.5	60	12,500	.6	1,190
Carlin Creek	205	.1	20	2,820	.1	330
Wolf Lodge Creek	590	.4	40	18,600	.8	1,320
Ungaged surface-water inflow	8,750	6.6	2,040	153,000	6.7	40,100
Wastewater	19,900	15.0	6,400	127,000	5.6	42,400
Precipitation	6,460	4.9	1,000	75,000	3.3	11,500
Outflow						
Ground-water outflow to Rathdrum Prairie	5,940	11.1	1,530	122,000	5.8	30,600
Lake storage change	410	.8	30	8,140	.4	720
Spokane River	47,600	88.1	3,760	2,020,000	93.8	150,000
Summary						
Total phosphorus				**Total nitrogen**		
Total inflow = 133,000				Total inflow = 2,270,000		
Total outflow = 54,000				Total outflow = 2,150,000		
Residual (outflow-inflow) = -79,000				Residual (outflow-inflow) = -120,000		
Overall error = 13,900				Overall error = 256,000		

Table 19. Nutrient budgets and errors for total phosphorus and total nitrogen, Coeur d'Alene Lake, 1992

[Loads and errors are in kilograms]

Budget component	Total phosphorus			Total nitrogen		
	Load	Percent of total	Error	Load	Percent of total	Error
Inflow						
St. Joe River	18,300	33.3	3,300	418,000	41.0	75,000
Coeur d'Alene River	9,980	18.1	1,600	314,000	30.8	49,000
Plummer Creek	1,130	2.1	100	21,900	2.1	1,920
Fighting Creek	410	.8	70	8,210	.8	1,490
Carlin Creek	106	.2	20	1,480	.2	330
Wolf Lodge Creek	217	.4	20	6,860	.7	620
Ungaged surface-water inflow	4,990	9.1	1,360	89,200	8.7	24,100
Wastewater	13,400	24.4	2,400	85,100	8.3	14,200
Precipitation	6,460	11.6	1,100	75,000	7.4	11,000
Outflow						
Ground-water outflow to Rathdrum Prairie	7,590	19.4	2,040	153,000	16.4	38,200
Lake storage change	200	.6	40	11,700	1.2	880
Spokane River	31,300	80.0	2,360	770,000	82.4	57,800
Summary						
Total phosphorus				**Total nitrogen**		
Total inflow = 55,000				Total inflow = 1,020,000		
Total outflow = 39,000				Total outflow = 935,000		
Residual (outflow-inflow) = -16,000				Residual (outflow-inflow) = -85,000		
Overall error = 5,660				Overall error = 117,000		

- Nitrogen inputs in 1991 were about twice as large as those for 1992.

- The lake did not act as a trap for nitrogen because inflow was about equal to outflow.

- The contribution of nutrients to the lake from private and municipal wastewater-treatment systems was dominated by the wastewater treatment plant at Page, which contributed 66 percent of the total phosphorus and 72 percent of the total nitrogen from such sources (table 20).

- The Coeur d'Alene River was the primary contributor of arsenic, cadmium, lead and zinc to the lake, with the 1991 input of zinc being the largest at 847,000 kilograms (930 tons).

- The lake acted as a trap for arsenic, cadmium, lead, and zinc.

NUTRIENT LOAD/LAKE RESPONSE MODEL

- The model divided the lake into six segments (fig. 7) in order to test the response of the individual lake segments to nutrient management scenarios.

- The nutrient load portion of the model accounted for the input or output of water and nutrients from 59 sources such as surface water inflow and outflow, precipitation and evaporation, private and municipal wastewater treatment systems, urban runoff, and groundwater.

- The lake response portion of the model accounted for the amount and movement of water and nutrients throughout the lake in order to assess how the lake responds physically, chemically, and biologically to changes in water and nutrient loadings.

- A wide variety of simulations was possible owing to the complexity of Coeur d'Alene Lake and its drainage basin, as well as the diversity of possible water quality management options. Simulations addressed two major questions: (1) would large increases in nutrient loadings cause the lake's hypolimnion to become anoxic, and (2) would the lake's water quality be substantially improved by large reductions in nutrient loadings.

- Simulations have indicated the northern two-thirds of the lake has a large capacity to receive additional inputs of nutrients before the hypolimnion becomes severely depleted of dissolved oxygen.

- The simulated removal of all wastewater generated nutrient loadings improved lake water quality more than the simulated nutrient reductions resulting from implementation of best management practices for forestry and agriculture within the Coeur d'Alene and St. Joe River basins.

TRENDS IN LAKE WATER QUALITY

- The National Eutrophication Survey, conducted on Coeur d'Alene Lake during 1975, found the lake to be mesotrophic, or moderately enriched, based on information on nutrients, chlorophyll, dissolved oxygen depletion, and the incidence of blue-green algae (U.S. Environmental Protection Agency, 1977).

- The nutrient budgets developed by the National Eutrophication Survey were compared to the 1991 nutrient budgets (table 21); loadings of nitrogen and phosphorus in

Table 20. Annual loads of total phosphorus and total nitrogen to Coeur d'Alene Lake from nearshore and municipal wastewater-treatment systems, 1991 and 1992

[kg, kilograms; TP, total phosphorus; TN, total nitrogen; WWTP, wastewater-treatment plants]

Load source (fig. 1)	Annual load for 1991 and 1992 (kg)		Percent contribution to annual load for 1991 and 1992 (kg)	
	TP	TN	TP	TN
Nearshore[1]	390	4,900	4.7	8.7
Municipal WWTP				
Clarkia	20	315	.3	.6
Santa/Fernwood	60	320	.7	.6
St. Maries	1,400	3,720	17.1	6.6
Plummer	290	1,560	3.5	2.8
Mullan	310	2,550	3.8	4.6
Smelterville	225	1,550	2.7	2.8
Page	5,400	40,500	65.7	72.5
Harrison	120	450	1.5	.8
Total	8,220	55,900	100.0	100.0

[1]Sum of private, community, and commercial wastewater-treatment systems within 150 meters of lake shoreline.

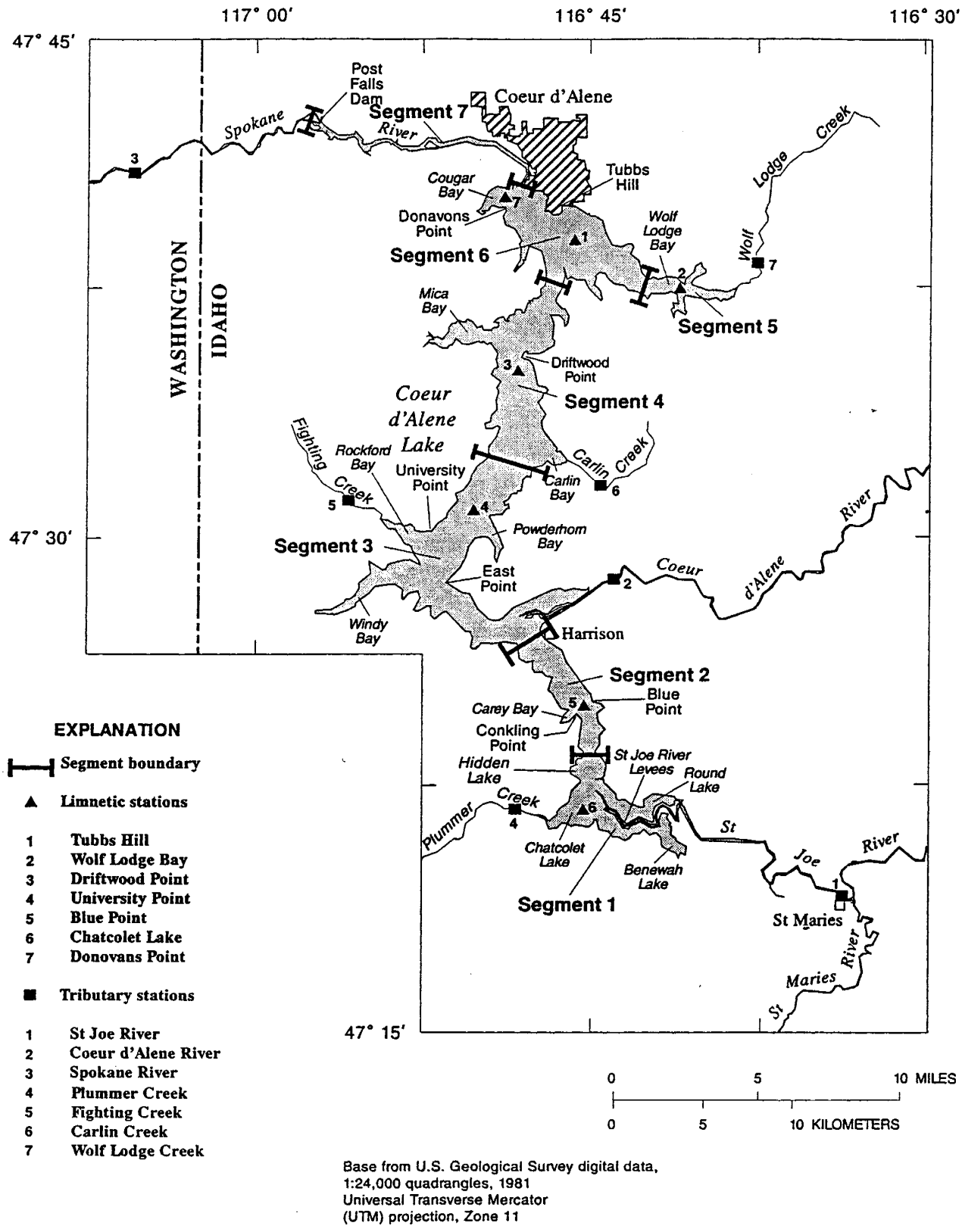


Figure 7. Segmentation of Coeur d'Alene Lake for nutrient load/lake response model.

1975 were twice what they were in 1991 (when loadings are based on equivalent streamflows for both years). - In 1975, the Coeur d'Alene River was the principal contributor of phosphorus; in 1991, it was the St. Joe River.

- In 1975, the Coeur d'Alene and St. Joe Rivers contributed nearly equal amounts of nitrogen; in 1991, the St. Joe River was the principal contributor.

- These substantial reductions in nutrient loadings have allowed Coeur d'Alene Lake to improve from mesotrophic to oligotrophic over the course of about 15 years.

- Reductions in nutrient loads are attributable to the cumulative effects of numerous actions. Two of the more visible actions were the closure of the phosphorous plant at the Bunker Hill complex and the diversion of untreated domestic wastewater to municipal wastewater treatment plants.

- Less quantifiable reductions in nutrient loads have accrued because of recent implementation of best management practices for timber harvest and agricultural activities.

- The recent improvement in water quality applies primarily to the deep, open lake area north of the mouth of the Coeur d'Alene River; the shallow, southern area of the lake has not shared equally in this improvement.

Table 21. Loads of total phosphorus and total nitrogen to Coeur d'Alene Lake, 1975 and 1991

[kg, kilograms; TP, total phosphorus; TN, total nitrogen]

Load source	1975 loadings[1] (kg)		1991 loads[2] (kg)	
	TP	TN	TP	TN
Coeur d'Alene River	98,100	1,490,000	11,000	572,000
St. Joe River	56,300	1,480,000	54,000	794,000
Other[3]	25,600	430,000	25,000	234,000
Total load to lake	180,000	3,400,000	90,000	1,600,000

[1] From U.S. Environmental Protection Agency (1977); loadings based on long-term annual mean discharge.

[2] Measured 1991 loads reduced by 30 percent to estimate loadings at long-term annual mean discharge.

[3] Includes minor tributaries, nearshore septic tanks, direct precipitation to lake surface, and wastewater-treatment plants.

LAKE MANAGEMENT PLAN

INTRODUCTION

The lake management plan has been developed in three major stages. At first, a lake management plan workgroup used the results of the 1991-93 lake study to identify water quality issues and suggest potential goals and methods for management of the lake's water quality. Then, intensive program of public involvement and education was undertaken to encourage the public to select their preferred goals and management actions. The preferred goals and management actions were then written. An environmental evaluation was prepared to discuss the positive and negative effects of the preferred management actions. A monitoring plan was designed to assess the effectiveness of the management actions for attaining the management goals.

LAKE MANAGEMENT PLAN WORK GROUP

The Lake Coeur d'Alene Management Plan development was steered by a committee of representatives of Division of Environmental Quality (DEQ), Coeur d'Alene Tribe, Clean Lakes Coordinating Council (CLCC), US Geological Survey (USGS) and Commissioners of Kootenai, Benewah and Shoshone Counties. The lake management plan workgroup prepared a document entitled, "Draft Coeur d'Alene Lake Management Plan" and released it for public comment in April, 1994 (Coeur d'Alene Basin Restoration Project, 1994).

A major goal of that document was to illustrate the connection between the technical results of the 1991-93 lake study and the management approach developed by the lake management plan workgroup. Another goal was to identify and discuss other water quality oriented studies or activities within the basin so they could be integrated into the lake management planning process. The draft did not make specific recommendations as to water quality management goals and methods pending the public's opportunity to comment on the draft. A summarization of the April, 1994 draft's major points follows.

TRENDS IN LAKE WATER QUALITY

Coeur d'Alene Lake's water quality has improved during the last 15-20 years. This positive trend is attributable to the enactment of environmental laws by federal, state and local governments, and a growing societal awareness of environmental issues. As result, settling ponds for mining and smelting wastes were installed in the late 1960's and effective sewage treatment began in the Silver Valley in the mid-1970's and into the 1980's. State and local standards for subsurface sewage disposal were also made more stringent. State laws now require the use of best management practices (BMPs) for reducing water quality effects of timber harvest activities. Encouraged by economics, as well as by state and federal programs, agricultural practices that reduce erosion and sedimentation have also come into more widespread use. All of these factors, along with a growing environmental awareness and the transition to an economy less dependent on natural resources extraction, have contributed to the recent improving trend in water quality in Coeur d'Alene Lake.

Although Coeur d'Alene Lake has become visibly "cleaner" in recent years, the potential still exists for serious and widespread water quality degradation given present trends in population growth and lake use coupled with the extent of past pollution. Significant depletion of dissolved oxygen still occurs in deep, bottom waters during the late summer. The shallow, southern lake area and several bays are becoming shallower because of sediment eroded from agricultural and timber lands as well as from nearshore areas being developed for residential and recreational uses. These same waters are becoming infested with aquatic plants.

Excessive growth of attached algae can be seen on shoreline rocks, docks, and boats in some nearshore areas. Sewage treatment facilities in the basin still contribute a sizable portion of the lake's potentially controllable nutrient load. The bed and banks of the lower reaches of the Coeur d'Alene and St. Joe Rivers continue to be eroded and transport heavy loads of sediment and nutrients into the lake. Much of the bottom of the lake is blanketed with sediment containing high levels of heavy metals as well as substantial amounts of nutrients. Contaminated wastes from past mining in the Coeur d'Alene River drainage continue to flow into the lake in significant amounts.

Perhaps the greatest threat to Coeur d'Alene Lake is the potential for reversal of the recent improvements in water quality. Such a reversal could be brought on by the rapid increases in lake use, population growth, and land development now occurring throughout the basin. Unless preventative measures are initiated soon, the recent improvements in lake water quality could be eroded or lost.

WATER QUALITY MANAGEMENT ZONES

Viewed as a whole, Coeur d'Alene Lake exhibits relatively high water quality. Yet both the lake study data and public and agency perceptions reveal specific geographic areas of concern and specific water quality issues. It is not appropriate to apply a single water quality management strategy to the whole lake or watershed. Therefore, the lake has been divided into four water quality management zones. Each zone focuses on specific water quality management issues, goals, and management approaches pertinent to that zone. The four water quality management zones include:

1) the nearshore zone (water depths less than 20 feet);

2) the shallow, southern zone which is south of the mouth of the Coeur d'Alene River, and includes the shallow lakes (Benewah, Chatcolet, Hidden, and Round);

3) the lower reaches of the Coeur d'Alene and St. Joe Rivers that are affected by backwater from Coeur d'Alene Lake; and

4) the deep, open water zone which is north of the mouth of the Coeur d'Alene River.

The Spokane River arm of the Coeur d'Alene Lake is not included as a zone because its management is being addressed by a phosphorus load allocation study being conducted by Idaho Division of Environmental Quality. The 1991-1993 lake study included data collection on the Spokane

River arm, but only to quantify its contribution to hydrologic and nutrient budgets being discharged through Post Falls Dam.

There are specific tributary watersheds that were identified as needing special attention. The identification came from public and agency comments as well as from analyses of nutrient loading data generated by the lake study. These areas include, but are not limited to, the following:

- lower St. Joe River
- St. Maries River
- upper St. Joe River
- nearshore area, Harrison to St.Maries
- Benewah Creek
- Plummer Creek
- Lake Creek
- nearshore area, Windy Bay to Chatcolet Lake
- nearshore area, Windy Bay
- Fighting Creek
- Cougar Creek
- nearshore area, Mica Bay to Cougar Bay
- lower Coeur d'Alene River

WATER QUALITY MANAGEMENT GOALS

Each of the four water quality management zones has the following potential water quality management goals from which to select:

1) improve water quality slowly (low cost management alternatives); and

2) improve water quality rapidly (high cost management alternatives).

Selection of a water quality management goal for each water quality management zone must consider the applicable Idaho and federal water quality criteria and standards. The Idaho Water Quality Standards and Wastewater Treatment Requirements designate the appropriate beneficial uses of Idaho's waters and list specific water quality criteria to be used to determine if a beneficial use is fully supported by the water quality conditions of the subject water body. Federal Standards and criteria are used directly only by reference in the Idaho Standards.

All four management zones experience conditions which exceeded of water quality standards for at least one contaminant; therefore, a goal to maintain the current water quality condition is not a legally viable goal. A "No Action " goal (that is, not taking additional water quality management actions other than are currently being taken) was not considered because, given the current level of activities within the Coeur d'Alene Lake basin, lake water quality is likely to deteriorate unless mitigative actions are implemented.

The public chose the slow improvement option as the goal for the plan.

PUBLIC INVOLVEMENT AND EDUCATION

The lake management plan workgroup recognized the need to involve the public in the decision making process because, without public input and support, implementation of the chosen management goals and methods would be difficult. A public involvement and education plan was written in December, 1993 with the following three goals:

(1) generate support and input for the plan and subsequent implementation from all

stakeholders;

(2) educate the public about existing lake conditions; what the public can do to help, and what agencies are doing to help; and

(3) meet the requirements for public involvement and education under the Idaho Nutrient Management Act, Idaho Clean Lakes Act, and the federal Clean Lakes program.

To achieve the three goals, the lake management plan workgroup employed the following five strategies:

(1) public meetings,

(2) community presentations,

(3) monthly updates/fact sheets,

(4) media relations, and

(5) technical advisory groups.

PUBLIC MEETINGS

Two sets of public meetings were conducted prior to the development of the initial draft of the lake management plan. A third set of public meetings were conducted in late 1994 to present a complete draft of the lake management plan. A public hearing was conducted in 1995 to consider adoption of the final version of the lake management plan in 1996.

The first round of public meetings was in July 1993 at four locations within the basin: Coeur d'Alene (two meetings), St. Maries, Kellogg, and Plummer. Following a short summarization of results from the 1991-93 lake study, participants were asked about their concerns and management priorities for Coeur d'Alene Lake. At each meeting, the participants broke into groups to list and prioritize their concerns. A summary of the concerns expressed at this round of meetings (Appendix B) has helped to guide the lake management plan workgroup.

The July 1993 meetings raised two issues not previously addressed by the lake management plan workgroup. More involvement by local government was requested. In response, county commissioners from Benewah, Kootenai, and Shoshone Counties became members of the lake management plan workgroup in order to help set the agenda for the lake management plan. The lower reaches of the Coeur d'Alene and St. Joe Rivers were added as a water quality management zone.

The second round of public meetings was in April 1994, in Coeur d'Alene, Kellogg, St. Maries, Worley, and Spokane. During these meetings, a more detailed summary of the lake study was presented, as well as explanations of the four water quality management zones and the overall planning process. The public was asked to help the lake management plan workgroup set goals for the long term management for each of the four zones. Questionnaires with a list of management choices were distributed prior to a question and answer session. Of the attendees, 76 turned in completed questionnaires. The summary of the completed questionnaires (Appendix D) has been used in development of the lake management plan.

The questionnaires from the April 1994 meetings indicated the public wanted a "go slow" approach to lake management. The public did not want expensive "in-lake" methods applied to existing problems. With

the advent of environmental laws, the lake has slowly improved over the past 20 years; the public wanted to see that trend continue in most areas. However, many comments were raised about pollution problems in specific areas, such as the southern lake and the erosion of river banks.

A series of five public meetings considered the draft Coeur d'Alene Lake Management Plan during November 1994. The meetings were in Coeur d'Alene, Kellogg, St. Maries, Plummer and Post Falls at the beginning of a planned 45 day comment period. Comments on the plan were solicited with comment forms. Letters of comment were encouraged. At the request of the Coeur d'Alene Basin Restoration Project's citizen's advisory committee and the general public, the comment period was extended an additional 30 days. Thirty-three written comments concerning the plan were received. Letters of response were sent to each individual who provided written comment. The comments and the response letters are exhibited in appendix E.

COMMUNITY PRESENTATIONS

To generate public awareness and support for the lake management plan, 30-minute presentations were made to 20 community, business, professional, and other groups during their regularly scheduled meetings. A short summary of the lake study findings and the lake management planning process was presented. Similar presentations were made to the following advisory groups associated with the Coeur d'Alene Basin Restoration Project (CBRP): Coeur d'Alene Basin Interagency Group (CBIG), Citizen's Advisory Committee for CBRP, and Management Advisory Committee for CBRP.

An information booth was used to distribute fact sheets, questionnaires, and to show a 10-minute video presentation at the Spokane Boat Show and the Coeur d'Alene Silver Lake Mall's "Community Days" in February 1994. The booth was staffed throughout both events to provide information and answer questions about Coeur d'Alene Lake and its developing lake management plan.

MONTHLY UPDATES/FACT SHEETS

Written information was also produced as part of the educational effort. They mailed a two-page Monthly Update to about 400 addresses beginning in March 1994 to regularly inform them of the progress on the lake management plan. Fact Sheets were also written to summarize the lake study results and the lake management planning process. These have been distributed during the public meetings and community presentations and have been used to satisfy requests. A summary of the lake management planning process was included in a newsletter published by a real estate company for mailing to waterfront homeowners in the Inland Northwest.

MEDIA RELATIONS

Press conferences in December 1993 and April 1994 briefed the media about the lake study results and promote the lake management plan. Articles appeared in the local and regional newspapers and news reports were aired on three local television stations.

Paid advertisements in local and regional newspapers announced the dates and location of the public meetings in July 1993, April 1994 and November 1994. The meetings also were announced via the "Community Calendar" services provided by local

newspapers and radio and television stations.

TECHNICAL ADVISORY GROUPS

The principal method to involve the public in the lake management planning process was the formation of five technical advisory groups (TAGs). The five TAGs were formed to discuss the water quality issues, goals, and management actions associated with the following topics: forest practices, agriculture, development (with a recreation subgroup), southern lake, and rivers. More than 80 people participated in the TAGs; they represented local, state and federal agencies, industry, environmental organizations, plus community and business associations. Each group had a facilitator who was a member of the lake management plan workgroup.

An orientation meeting in April 1994 provided an overview of the lake study results and educated the TAG members about their role in the lake management planning process. At that meeting, the TAGs were advised of the management goals for each of the four management zones (selected during the April 1994 public meetings). Each TAG then met separately over the next several months. Each studied their water quality issues and developed management action suggestions. Each TAG reviewed and commented upon the management actions proposed by the other TAGs. All TAG meetings were open to the public. The lake management recommendations of the TAGs were incorporated into this final draft lake management plan, provided they fell within established legal constraints.

REGULATORY FRAMEWORK FOR MANAGEMENT OF POINT AND NONPOINT SOURCES

Many of the management actions recommended in Tables 22 to 30 seek to limit inputs of nutrients and sediments from point and nonpoint sources. Some of the management actions are already included within the current regulatory framework designed to manage these sources.

Point sources of nutrients are wastewater treatment facilities and confined animal feeding operations. These sources are managed under the federal Clean Water Act (CWA) through the National Pollutant Discharge Elimination System (NPDES) program as major and minor sources, respectively. Major sources are permitted with restrictions protective of the water, while minor sources must develop and implement a pollution abatement plan protecting water. The NPDES program is administered in Idaho by EPA with the state providing assurance that discharges allowed will meet state water quality standards.

Nonpoint source management occurs under an array of federal, state and local programs. Planning to address nonpoint sources of pollutants began with the inclusion of section 208 in the 1978 re-authorization of the CWA. Statewide nonpoint source management plans and funds for demonstrating projects were provided by section 319 of the 1987 re-authorization. Decision on the approaches to nonpoint source management in Idaho have been primarily made at the state level by the executive and legislative branches. Recent federal farm legislation has increased use of nonpoint source control practices in

agriculture.

Agriculture activities which abate water quality impacts are managed under the state Agricultural Water Quality Program (SAWQP). SAWQP is a voluntary program in which state funds are used to cost share with farmers for installation of improvements which will reduce erosion and limit sedimentation and nutrient release. Farmers pay 25-100 percent of the cost of a practice either out of pocket or as "in-kind" labor. Although SAWQP is voluntary, federal farm legislation (Food Security Act of 1990) requires farmers to develop a farm conservation plan which addresses the most erodible acres and requires minimum crop wastes to be left to protect the soil. These measures are required in order to qualify the farmer for crop support payments. The same body of legislation provides for the Conservation Reserve Program (CRP) which pays a subsidy for the removal of highly erodible acres from crop production.

Forest harvests are regulated for water quality impacts on all forest lands within the state by the Idaho Forest Practices Act. Rules and regulations promulgated by the state Land Board are designed to limit erosion from forest soils and the accompanying yield of nutrients. Compliance with these best management practices (BMPs) is referenced in the state water quality standards as compliance with the CWA. In order to harvest timber and sell logs these practices must be met as a matter of law. The Department of Lands (IDL) maintains a staff of 3.5 forest practice advisors in the Coeur d'Alene Lake Basin to inspect forest harvest projects and enforce the rules. Installation of the structural BMPs designed to protect water quality is a harvest expense.

Surface mining operations are governed by the Surface Mining Act. A set of rules and regulations have been promulgated by the Land Board to implement the act. The rules are the BMPs for abatement of water quality impacts from surface mining activities. Inspections of surface mining operations are conducted by IDL and rules are enforced. Currently, IDL has one inspector assigned to the Coeur d'Alene Lake Basin.

Regulation of nonpoint source impacts of development other than centralized sewage treatment are largely delegated to the counties, cities and health districts by the Subdivision Act and the Public Health District Act of 1970. The Panhandle Health District reviews and approves plans for installation of on-site wastewater treatment systems. Some counties and cities review and approve ordinances to regulate planning and zoning, building permits, set back requirements and stormwater. The construction and maintenance of county, city and many private roads could be regulated in the same way. Highway districts work with the Idaho Department of Transportation (IDT) to manage highway construction activities. A set of voluntary road construction and maintenance BMPs have been developed by IDT and DEQ to address the nonpoint source impacts of these activities. Projects which potentially cause nonpoint source pollution absorb the cost of nonpoint source controls with fees and/or increased construction costs.

MANAGEMENT ACTIONS PER TECHNICAL ADVISORY GROUPS

FOREST PRACTICES

The Forest Practices TAG included a mix of federal, state, tribal, private forestry and hydrology experts plus a local environmental group representative. A wide ranging list of issues was initially generated, followed by detailed discussion of each. Of 22 issues reviewed by this group, 11 were retained as specific recommendations for the lake plan. The remaining 11 items were dropped from further consideration and no specific actions or recommendations were developed. (More details on the entire list of 11 issues are available from the lake planning team, upon request).

This TAG group recognized that there have been improvements in Coeur d'Alene Lake's water quality over the past 15 years, coinciding with implementation of forestry best management practices (BMPs) and the continuing trend toward strengthened BMP regulations under the Idaho Forest Practices Act (FPA). It is the consensus of the Forest Practices TAG that Idaho's existing FPA, antidegradation feedback loop, and effectiveness monitoring processes provide the best current mechanisms for meeting the objective of "slow-improvement" in Coeur d'Alene Lake water quality. In addition, there are other forest practices issues such as education, enforcement, and cooperative planning that should be addressed to strengthen effectiveness of existing programs.

Specific BMPs and other lake management suggestions that received general consensus from participating forest practices TAG members are listed in Table 22.

AGRICULTURE

The agriculture TAG began with a discussion of mission and roles as well as operating guidelines. The first meetings were presentations from the various agriculture agencies on the existing programs. Topics discussed were Idaho Agricultural Pollution Abatement Plan; the various technical, financial, and educational assistance programs; past and present Coeur d'Alene Basin agricultural water quality projects; as well as lists of Best Management Practices (BMPs) being used in the Coeur d'Alene Basin to protect and improve water quality. The group was presented the most recent findings of the lake water quality monitoring results.

With that background, the group was asked to formulate specific management alternatives to restore and maintain water quality in the Coeur d'Alene Basin. Early in the discussion the group agreed to use existing technical, financial, and educational programs to treat agricultural lands in the watershed as a whole, and did not prioritize specific sub-watersheds for treatment.

The group was given lists of management alternatives from the Hayden, Pend Oreille, and Twin Lakes Lake Management Plans. From those lists the group discussed various alternatives and iterations of alternatives to arrive at a final draft list. Management actions recommended for agriculture are listed in Table 23.

Several participants suggested changing the use of agricultural BMPs to improve and protect water quality from a voluntary to a mandatory program. Those suggestions are omitted because the Idaho Agriculture Abatement Plan signed by the Governor and

Table 22. Management actions recommended by forest practices technical advisory group.

Management Actions	Priority	Lead	Estimated Cost	Funding Sources
Action 1: Adopt minimum 30' Stream Protection Zone (SPZ) for all CDA basin streams not capable of supporting significant fisheries (Class II).	2	IDL	Minimal	IDL
Action 2: Implement pre-operation inspection for all proposed timber harvest and related road construction.	1	IDL	$75,000/yr	IDL
Action 3: Streamline stream alteration permit process; make application procedure less time-consuming and more user-friendly to foster compliance.	2	IWR	Minimal	IWR
Action 4: Develop more prescriptive stream-crossing and stream alteration BMPs that provide a high level of water quality protection from road sediments. Promote more administration and/or enforcement of the Stream Alteration Act within the basin for crossing, alteration proposals.	2	IWR IDL	Minimal	IWR,IDL
Action 5: Add one additional full time FPA administrator in the basin to IDL staff, to inspect forest practices and enforce the FPA rules and regulations.	1	IDL	60,000/yr	Legislature
Action 6: Include intensive, continuous Information and Education program in lake plan that is aimed at forestland owners, loggers, road contractors, having demonstration sites for state-of-the-art forest management.	3	IDL, U of I C.E.S	20,000	IDL, Forest Industry
Action 7: Adopt Idaho FPA proposed "Cumulative Watershed Effects" process and implement it. Train public and operators in its use.	1	IDL, legislature	$8,000-$15,000 Watershed	
Action 8: Minimize road construction impacts in basin by cooperating on joint access development to forest stands.	3	All landowners	Minimal	
Action 9: Secure necessary funding to meet present and future maintenance needs on forest roads.	1	IDL Counties, USFS, BLM Industrial Forestland Owners		USFS,BLM, IDL, Legislature, Forest Industry
Action 10: Encourage landowners to manage forestlands to minimize potential water quality impacts of high-intensity wildfire while maintaining other resources.	3	All landowners		

Action 11: Idaho FPA Advisory Committee should review current state of FPA compliance and enforcement; develop recommendations for additional compliance incentives.	2	IDL, FPAAC,Id Land Board	Minimal	

Table 23. Management actions recommended by agriculture technical advisory group.

Pollution Management Actions **Goal: Reduce non point source pollution from agriculture lands by increasing the voluntary implementation of BMPs* on cropland, hayland, pasture and confined animal feeding areas in order to reduce the amount of sediment, nutrients, pesticides and bacteria reaching Coeur d'Alene Lake and its tributaries.**	Priority	Lead	Estimated Cost	Funding Sources
Action 1: Continue to aggressively encourage voluntary implementation of BMPs through existing SCD, SCS and ASCS programs.	1	SCD	$20K	County State
Action 2: Focus attention on those tributaries which produce high levels of nutrients, sediment, pesticides and bacteria from agricultural sources.	1	SCD	N.A.	N.A.
Action 3: Encourage Soil Conservation Districts to apply for state Agricultural Water Quality Program planning and implementation grants on priority Stream Segments within the Coeur d'Alene Lake Basin. Coordinate with CdA Tribe on reservation lands.	1	SCD	$100k/Plan $1M/imp	WPCA; Farmer match
Action 4: Conduct a River Basin Study of the St. Joe River sponsored by the Benewah Soil Conservation District and carried out by the USDA agencies.	1	SCD	$225K	USDA
Action 5: Make structural sediment and erosion control practices high priority for all current and future agriculture programs and projects which supply financial and/or technical assistance to agricultural producers. These practices should be tied to vegetation improvements, i.e., grassed waterways and riparian planting.	1	SCD	N.A.	N.A.
Action 6: Continue existing cropland management practices through aggressive implementation of federal Farm Bill requirements and other programs.	1	SCD	N.A.	N.A.
Action 7: Implement an aggressive information and education program within the basin to increase agricultural producer's and the general public's knowledge of the technical and financial assistance available for BMP installation and the benefits to the lake, the land and the producer when BMPs are installed and maintained. Included in the Information and Education program should be the demonstration of new technology and management practices. Encourage On Farm Testing.	1	CES SCD CBRP	$35K	CES SAWQP CBRP
Action 8: Provide assistance to hobby farms which are impacting water quality; provide them with livestock management BMPs.	1	CES CBRP		SCD
Action 9: Provide technical and financial assistance to confined animal feeding operations to implement livestock BMPs.	2	SCD		SCD

Action 10: Restore natural vegetation buffers along creeks and drainageways to minimize runoff from adjacent lands through education and/or seek tax incentives for placing in reserve.	1	SCD SCS County		County
Action 11: Implement water quality monitoring to determine effectiveness of agricultural BMP installation and maintenance on SAWQP streams.	1	DEQ	$30K	WPCA
Action 12: Request that ASCS approve Benewah County for participation in Integrated Crop Management program.	1	ASCS		ASCS ACP
Action 13: Encourage zoning ordinances that preserve land for agricultural use.	2	County		County
Action 14: Identify and provide technical assistance for streambank stabilization for streams in agricultural areas.	2	Private SCD Tribe		ACP

Notes:

Action 4. River Basin Studies quantify the production of sediment and nutrients from land uses within the study area in order to identify potential remediation actions to reduce production of sediment and nutrients from erosional processes.

* As defined by the SCS Field Office Technical Guide and the Idaho Agricultural Pollution Abatement Plan.

approved by EPA recognizes the most effective approach to control pollution from agricultural lands is one of strong technical and financial assistance supported with an effective information and education program. Farmers receiving financial assistance are bound by contractual agreement with the funding agency to implement mandatory BMPs. The group recognized that changes from a voluntary program to a strictly mandatory will require changes in state law.

DEVELOPMENT: STORMWATER, ROADS, WASTEWATER AND MISCELLANEOUS TOPICS

Effective management of stormwater from developed and developing areas was a high priority for the TAG which drafted this section of the Lake Management Plan. Though there is no monitoring data for runoff from residential/commercial areas in the Coeur d'Alene Basin, data from other regions suggest that phosphorus export from developed areas is typically one to two orders of magnitude (10-100 times) greater than undeveloped areas, with even higher export rates for areas under construction.

Education and regulation are the key components of this section of the plan. Education is needed because many do not understand the effects of uncontrolled stormwater and erosion/sedimentation on water quality. Increased regulation, including performance standards, and "no net increase" requirements, is needed to create a level playing field for builders and developers, and to ensure that stormwater from new development does not increase the phosphorus load to the lake. Because residential and commercial development cause such a great increase in phosphorus export, and because of the difficult nature of stormwater management, the goal selected for this section of the plan is to maintain current levels of phosphorus export; it was felt that stormwater loads could not be reduced without severely limiting development in the Basin. Management actions recommended for stormwater are listed in Table 24.

Roads and driveways were identified as a significant source of sediment and phosphorus which can and should be reduced. Unlike stormwater runoff from developed properties, there seem to be many options for reducing the impact of roads on lake water quality. Recommendations include various alternatives for improving construction of new roads, for controlling erosion and runoff, for obliterating or upgrading substandard roads, and for increasing awareness of road related water quality problems. As with the stormwater section of the plan, it is recommended that new roads be managed in a manner which will prevent the increases in phosphorus export to the lake. In addition, it is recommended that sediment and phosphorus export from existing roads be substantially reduced. Management actions recommended for roads are listed in Table 25.

Wastewater from sewage and septic systems was identified as another phosphorus source which can and should be reduced. For existing systems, the focus of this section of the plan is on reducing phosphorus loads in the most cost effective manner possible. For new systems, the focus is on installing systems with the least effect on water quality. To expedite the upgrade of substandard systems, it is recommended that developers be given the option of mitigating increased phosphorus loads which they cannot manage on site, by contributing funds to be used for systems

Table 24. Management actions recommended by development technical advisory group for stormwater.

Stormwater Management Actions **Goal: Maintain current phosphorus export in most cost effective manner.**	**Priority**	**Lead**	**Estimated Cost**	**Funding Sources**
<u>Existing Stormwater Runoff</u> Action 1: Provide information and technical assistance to businesses, recreationists, cities, agencies, property owners and the general public. a) Develop "Master Gardener's" type program . b) Develop a homeowners kit with info about landscaping and other methods of reducing and treating stormwater. c) Provide staff to conduct stormwater audits for businesses and property owners. d) Promote, in conjunction with the University of Idaho Cooperative Extension, the use of "lake friendly" products such as lawn fertilizer which does not contain phosphorus, and grass species which require less fertilizer. e) Inform the public on the effects of their actions, such as burning on the lakeshore and in road side ditches, boat washing, etc.	1	KC, SC, BC, DEQ	variable	fees, EPA §319, storm water utility, State of Idaho, Counties
<u>Stormwater Runoff From New Development</u> Action 2: Provide contractors, utility companies and the public with information on stormwater management. a) Encourage companies such as Washington Water Power to incorporate erosion control into the siting, installation, and maintenance of utilities. b) Provide information on the effects of burning construction debris on the lake shore and weeds in ditches along the road side. c) Require permit applicants to pass a test on stormwater management concepts.	1	KC, SC, BC, DEQ	variable	EPA §319 program, storm water utility, State of Idaho, Counties

Action 3: Expand existing stormwater treatment and erosion control requirements in the portions of Kootenai County which are in the Cd'A Lake Basin, to better prevent phosphorus and sediment loading from grading and development activities.			See notes	EPA §319 and §104.B3, storm water utility, fees, State of Idaho, Counties
a) Establish a stormwater ordinance requiring that development projects include a combination of stormwater treatment and pollution trading which will result in no net increase in phosphorus loading to Lake Coeur d'Alene. Expand Kootenai Counties BMP handbook to include other treatment options, in addition to swales.	1-2	KC, Cities in KC, DEQ,CT		
b) Identify phosphorus sources which might be reduced to offset increased phosphorus export from new development.	1	DEQ,PHD, USFS,KC,high-way districts		
c) Establish an ordinance requiring that erosion from development related grading projects be controlled.	1	KC,Cities in KC,CT		
d) Improve enforcement of existing erosion control requirements, including maintenance requirements. Hire staff to enforce stormwater/erosion/grading ordinances.	1	KC		
e) Establish performance standards which will minimize the quantity of sediment leaving property boundaries. (For example, prohibit increases in sediment export, or if sediment export is allowed, limit it to identified numeric standards; require stabilization within 7-14 days of soil disturbance).	2	KC,Cities in KC,DEQ, PHD,CT		
f) Adopt a Health District regulation requiring erosion control during the installation of subsurface sewage disposal systems.	3	PHD		
g) Explore funding options for stormwater and erosion control programs, including a stormwater utility.	1	KC,DEQ, PHD		
Action 4: Implement stormwater and erosion control programs throughout the remainder of the Cd'A Basin which are at least as stringent as that in place in Kootenai County in 1994.	1	SC,BC,CT, Cities in 3 Counties	variable	EPA§319,fees, utility, State of Idaho, counties
Action 5: Identify areas with a high erosion risk on plat maps of new subdivisions to inform prospective buyers/builders of the true cost involved in site development.	1-2	KC,SC,BC		developers

Action 6: Review the need to increase minimum lot sizes, increase surface water setbacks, and preserve native vegetation buffers. If necessary, develop ordinances designed to minimize sediment and phosphorous export, maintain stable lakeshores and streambanks, and ensure there will be no net increase in phosphorous exported from new development. Any new ordinances should be based on the performance standard of "no net increase" in phosphorous. New standards should apply to new, existing and platted lots along the lakeshore and its tributaries. Any variances granted should be contingent upon the project achieving no net increase in sediment and phosphorous export from development sites.	2-3	KC,BC,SC, CT, Cities in CdA Basin, DEQ		
Action 7: Prohibit burning of construction debris on lakeshores and adjacent to streams and drainageways.		KC, SC, BC, local Fire Districts		

Notes:

Action 1a. - The University of Idaho Cooperative Extension System has a Water Watch manual which may be adapted for this purpose. The UI has conducted Master Water Watch programs in the past and is willing to do so again if funding is available and other agencies participate in planning and recruiting participants.

Action 2a. - Erosion control techniques for installation of utilities might include reseeding of disturbed areas, locating utilities away from streams and drainages, and timing projects to avoid rainy seasons.

Action 3a. - This would essentially be a pollution trading system, designed to offset new phosphorus loads by reducing existing loads. Mitigation actions might include: providing funds for upgrading the Page sewage treatment plant (to increase its phosphorus removal capabilities); replacing substandard septic systems; removing unneeded dirt roads; or surfacing poorly constructed dirt roads which are eroding into Lake Cd'A or its tributaries.

Existing BMP handbooks emphasize the use of grassed infiltration areas or "swales" for treating stormwater. While swales are an excellent stormwater treatment method on the Rathdrum Aquifer, they are often unsuitable in lake watersheds with steeper slopes, less permeable soils, and high water tables. Other stormwater treatment methods should be emphasized in these areas.

The cost of implementing these actions will vary depending on the number and site characteristics of new developments, and on the desired effectiveness of the program; costs probably range from $50,000 - $120,000 per year.

Action 3g. - If a stormwater utility were formed it would be important to clearly define how the monies would be used (e.g. inspection and maintenance of stormwater systems).

Action 5 - The purpose of this action would be to ensure that prospective buyers are aware that building on erosion prone sites may be difficult or impossible, and very costly.

Action 6 - The Basin Development TAG agreed that the need for increased setbacks and native vegetation buffers should be examined. They agreed that setbacks and buffers should be adequate to minimize sediment and phosphorus entering the lake, and to maintain a stable lakeshore and streambanks. Any new requirements should be based on water quality performance standards (such as a certain level of treatment, or a certain allowable quantity of phosphorus discharge), allowing setbacks to vary based on slope, soil type, vegetative cover etc. Also it was suggested that any buffer requirements be

waived in cases where there is no vegetation (e.g. a rock slope or bluff). Any variances granted should be contingent upon the project achieving no net increase in phosphorous and sediment export from development sites. The TAG could not agree on a width to recommend for buffer strips, if they are needed; suggested minimums ranged from 25 feet to 75 feet plus 4 feet for each % of slope.

Table 25. Management actions recommended by development technical advisory group for roads.

Road Management Actions **Goal: Substantially reduce sediment and phosphorus export from use and maintenance of existing roads; manage new roads so there is no net increase in phosphorus export.**	Priority	Lead	Estimated Cost	Funding Sources
Action 1: Identify owners of problem roads and driveways (USFS, state, County, Highway District, City and private) and encourage them to either obliterate or upgrade the roads in affordable increments. Use road improvements in pollution trading to offset increased phosphorus loads from new development. Encourage the use of the most cost effective, simple, expedient alternatives.	2	KC, USFS, IDL,BC,SC, highway dists., DEQ	Obliteration: ≈$105-$635/lb. P Reconstruction: ≈$2,800-$4,900/lb. P plus periodic maintenance and oversight of maintenance	EPA §319, fees, SW utility, developers, State, counties
Action 2: Develop regulations establishing minimum construction standards for private, residential roads and driveways, and require that existing roads being converted to residential use be upgraded to meet these standards, recognizing practical site limitations (e.g. permit variances for existing roads if it will decrease or not significantly increase sediment export to the lake or its tributaries). Provide land owners who are harvesting timber, with information on residential road construction standards through the Idaho Dept. of Lands.	1	KC,BC,SC, CT,IDL,ITD, DEQ, highway dists.		fees, developers, counties
Action 3: Incorporate water quality protection strategies into existing road standards, policies, procedures and decisions. Evaluate and, if necessary, revise or eliminate excessive requirements which impair water quality (e.g. wide roads and right of ways, maximum 6% grade requiring longer roads with more cuts and fills).	1	ITD,KC, BC,SC, Cities in Basin, CT, highway dists, DEQ		May be possible with existing staff
Action 4: Prevent sediment from entering road ditches from adjacent properties by adopting and enforcing erosion control and grading ordinances for development activities.	2	KC,BC,SC, Cities in Basin,CT,ITD highway dists.		See storm-water section
Action 5: Support adoption of ordinances, funding mechanisms, and programs which reduce road impacts to water quality.	2	General Public	N/A	N/A
Action 6: Request that the state, cities, counties and highway districts identify and prioritize road related water quality improvement needs, that they develop long range plans for correcting existing problems, and that they complete at least one high priority project each year.	1	highway dists, SC,BC,ITD, Cities in Basin		EPA §319, State of Idaho, counties

Action 7: Provide state, county, city and highway district personnel, businesses, and the public with technical assistance, including a) assistance in identifying situations and site specific problems affecting water quality, and b)information on maintenance and construction BMPs which can be used to reduce road impacts to water quality. Request that ITD personnel act as mentors to county and highway district staff, and that they assist with training of county road crews by inviting them to training seminars, and by providing them with printed material and video tapes of ITD seminars.	1	ITD,DEQ,KC, highway dists.		EPA §319, State of Idaho, counties
Action 8: Use LIDs (local improvement districts) to fund road improvements in populated areas.	2	KC,SC,BC, cities in Basin		private
Action 9: Encourage road jurisdictions to conserve financial resources by consolidating and/or sharing equipment, staff and functions (e.g. share wash pads, hire a grant writer for road improvement grants, consider having highway districts take over some functions of city road departments, if mutually agreed upon).	3	USFS,ITD, highway dists. BC,SC, Cities in Basin,PAC, IDL		May be possible with existing staff
Action 10: Secure grants and other funding sources for road related water quality improvement projects. Develop local, innovative funding of road programs which improve water quality, and which do not rely on property taxes.	1	PAC, highway dists., SC,KC, BC,ITD,CT, Cities in Basin		EPA §319, vehicle license fees
Action 11: Increase the general public's awareness of BMPs which should be used to control erosion and manage stormwater runoff, so they will recognize problems when they see them. Emphasize maintenance of private roads and driveways.	1	CLCC, ITD, KC,SC,BC, DEQ	variable	EPA §319, State of Idaho, counties
Action 12: Provide ITD and other road jurisdictions with vigorous, direct, constructive input about problem sites (e.g. bare slopes, erosion problems). Request that road jurisdictions use vegetative buffers between disturbed areas and streams/ drainages leading to streams.	1	General Public	N/A	N/A
Action 13: Strongly encourage ITD to complete the revegetation of the Mica grade and I-90 east of Cd'A (above Wolf Lodge Bay).	1	ITD		State of Idaho
Action 14: Request that volunteers responsible for litter collection on state highways also identify problem areas for ITD. Encourage, train and assist these groups to plant trees and other vegetation on cuts and fills.	3	ITD		State of Idaho
Action 15: Encourage the public to review proposed construction projects.	2	ITD,General Public	N/A	N/A

Action 16: Evaluate the level of treatment and stormwater retention needed for roads and highways in the Basin; expand regulations and policies as needed to prevent contaminants from reaching the water.	1	DEQ,CT and all road jurisdictions in the Basin		EPA §319, State of Idaho
Action 17: Request that road jurisdictions (ITD, highway districts, counties) control erosion during maintenance activities.	1	all road jurisdictions in the Basin		State of Idaho, counties

Notes:

Action 3 - The new Kootenai County road standards are in conflict with the stormwater ordinance and the related provision in the subdivision ordinance. It may be beneficial to water quality to permit private and small subdivision roads to serve the residential needs of a rural neighborhood without requiring large cutbacks and switchbacks which remove an excessive amount of vegetation. Variances should allow narrower roads with greater slope and more vegetative cover if it will reduce the quantity of contaminants flowing into the water, without compromising safety.

Action 6 - Road jurisdictions will need technical assistance to identify erosion and stormwater problems, and to develop mitigation plans.

Action 9 - The highway districts in Kootenai County already share some equipment and assist the cities on a case by case basis. Any consolidation of district services would have to be mutually acceptable to all involved agencies.

Action 10 - The Lake Cd'A Property Owners Association may wish to participate in raising grant match monies for specific projects which will enhance lake water quality.

Action 12 - These buffers could be temporary, used only during construction, which might eliminate the need to purchase easements.

Action 17 - Erosion control actions which might be appropriate during maintenance activities include seeding ditches following cleaning and using loose straw and silt fence on soils disturbed during replacement of culverts.

upgrades. Management actions recommended for wastewater are listed in Table 26.

A listing of recommendations that address topics such as implementation, funding, water quality standards, and miscellaneous management actions are in Table 27.

DEVELOPMENT-RECREATION SUBGROUP

Education and enforcement were identified as the highest priorities of the recreation subgroup. Several of the recommendations stemmed from the need to have better education programs, materials, maps and public outreach. Lack of adequate enforcement of existing ordinances and "rules of the road" were identified as key areas, as well.

For the most part, all the recommendations showed a greater need for either education and/or enforcement. For example, the majority of the public is not aware of erosion problems caused by excessive boat speeds in no wake zones or the effect on water quality from gray and black water disposal. From an enforcement standpoint, the Marine Sheriff's Department does not have the resources to enforce boater regulations when speed and no wake zones are ignored.

The subgroup unanimously agreed public education materials should address erosion caused by excessive boat speed, proper disposal of gray and black water and pump-out station locations. Maps are needed to identify speed zones, no wake zones as well as pump-out locations. Also there is a significant need to explain and encourage erosion control measure and decreased phosphorous and nutrient loading. Furthermore, the group stressed the importance of buffer zones for existing homes and the need to develop buffer zones for new homes.

In addition, the subgroup members strongly supported additional funding for the Marine Sheriff's Department in order to adequately enforce rules, regulations and ordinances (particularly Kootenai County's Ordinance No. 140A, addressing boat wakes), "rules of the road," boat speeds, and proper disposal practices. The subgroup recognized a significant need to increase the number of pump-out stations and promote waterborne outhouses on the lake. The management actions recommended by the subgroup are listed in Table 28.

SOUTHERN LAKE

The southern lake TAG primarily focused on slow reductions of nutrient loads via management of the aquatic macrophytes that occupy a significant portion of the shallow areas of the southern lake management zones. The TAG considered the following six alternatives for macrophyte management:

1) Lake bottom dredging-this alternative was dismissed because it is publicly unpopular, is very expensive, and has substantial impacts on the surrounding environment;

2) Herbicides-this alternative was dismissed because of toxicity concerns, impacts on biota, cost, and the fact that the U.S. Environmental Protection Agency is not funding lake restoration projects that include the use of herbicides;

3) Macrophyte mowing-this alternative was dismissed because it leaves the mowed vegetation in place and, thereby, adds nutrients

Table 26. Management actions recommended by development technical advisory group for wastewater.

Wastewater Management Actions Goal: **Eliminate and/or reduce discharge of nutrients in wastewater. Prevent impacts to beneficial uses as defined in the Idaho Water Quality Standards (beneficial uses include swimming, domestic drinking water etc.).**	Priority	Lead	Estimated Cost	Funding Sources
Action 1: Request that DEQ, EPA, and a citizen committee use the Total Maximum Daily Load process to evaluate impacts, conduct a financial evaluation of alternatives, and if needed, select methods of reducing phosphorous loads from wastewater treatment plants, beginning with the South Fork Sewer District's Page facility. Consider Basin wide funding alternatives.	1	DEQ,EPA CT	See Notes	Federal grants, State of Idaho, fees
Action 2: a) Identify old, substandard sewage disposal systems located along the tributaries and lakeshore in the Cd'A Basin. Develop a data base which can be used to locate and prioritize systems needing attention; b) Prioritize systems for upgrade and/or replacement based on their probable nutrient contribution to the lake.	(a) 1 (b) 2	PHD, DEQ, CT		EPA§ 319, State of Idaho, counties
Action 3: Encourage replacement of substandard sewage disposal systems by: a) Allowing nutrient loads for new development to be offset with upgrades of off site systems through a pollution trading system. b) Developing cost share and other incentives.	2	KC, DEQ	≈$4,400-$6,100 per pound P removed	private, developers, State of Idaho, EPA §319
Action 4: Improve maintenance of private sewage systems throughout the Cd'A Basin. Develop an operation, permitting or monitoring system and periodically inspect systems to ensure they are being maintained and are functioning properly. Vary inspection frequency according to need or use. Periodically mail maintenance reminders to homeowners with private systems.	1	PHD		fees, private, counties
Action 5: Use septic maintenance companies to help educate and communicate with homeowners about substandard sewage systems.	3	PHD		may be possible with existing staff
Action 6: Evaluate and if appropriate, modify private, Health District and state inspections of new sewage systems to ensure that systems are properly installed, and that inspection programs are as efficient as possible.	2	PHD, DEQ		may be possible with existing staff
Action 7: During plan reviews of both new and replacement sewage systems, consider clustering of the systems if it will have less impact on water quality than small, individual systems.	1 ongoing	DEQ, KC		may be possible with existing staff

Action 8: Study the effect of nitrogen on water quality, particularly in near shore areas. Where nitrogen is effecting water quality, identify and/or develop and install sewage systems which are more effective at removing nitrogen from effluent.	2	USGS, DEQ		EPA grants, State of Idaho
Action 9: Develop a method of pollution trading and/or credits so that increased phosphorus loads from new development can be offset by upgrading sewage treatment plants (i.e. new developments could have the option of mitigating their impact by contributing to a fund for needed upgrades).	2	DEQ,EPA		EPA grants, State of Idaho
Action 10: Ban phosphorus from commercial and residential laundry detergent and other cleaning products (e.g. dish washing detergent) throughout the Cd'A Basin.	1	KC,BC, SC, All Cities	minimal	existing staff

Notes:

Action 1 - It was determined that evaluation and selection of specific phosphorus reducing actions for the South Fork Sewer District's Page facility and other Waste Water Treatment Plants were beyond the scope of the planning committee. They recommend that a special committee be developed with representatives of DEQ, the sewer districts and interested citizens. It was also recommended that an economist, be consulted during the evaluation process.

As part of this wastewater review process, the effect of groundwater and stormwater infiltration on sewage lines should be explored. It appears that flows to both the Page and Plummer sewage treatment plants are higher then they need to be due to infiltration.

Providing alum treatment at the Page Plant will cost approximately $17-$34 per pound phosphorus removed to construct treatment facilities, plus approximately $17 per year per pound phosphorus to purchase alum. The cost of personnel, a billing system (if an additional one is needed), and periodic maintenance costs are not known.

Action 2 - The tax assessors may be able to help locate new systems, as this is something they look for when establishing property values.

Action 4 - This might be accomplished by contracting with septic system pumpers for operational inspections. The pumpers could be trained and certified by the Health District, and could provide the Health District with an evaluation report on each system they inspect.

Action 6 - As part of this evaluation consider transferring review and inspection authority for all engineered systems to DEQ.

Table 27. Management actions recommended by development technical advisory group for miscellaneous topics.

Implementation/ Funding/ Water Quality Stds./ Miscellaneous Management Actions	Priority	Lead	Estimated Cost	Funding Sources
Action 1: Require local, state and federal agencies to coordinate data gathering efforts.	1	DEQ		existing staff
Action 2: Establish a citizens committee to assist in developing and implementing a public information and education program for the Cd'A Basin, and in lobbying for plan implementation.	1	CBRP,CAC		State of Idaho
Action 3: Encourage the development of and promote "lake friendly" products (e.g. boat cleaner, pesticides/ herbicides, phosphorus free lawn fertilizer).	1	CLCC		State of Idaho
Action 4: Incorporate water quality protection strategies into county Comp Plans, and Zoning, Grading and Subdivision Ordinances.				
Action 5: Consider expanding the Cumulative Effects program to address all watershed activities; manage cumulative effects Basin wide.	2	IDL, CBRP		
Action 6: Establish funding for plan implementation, with an emphasis on fees for service, user fees, and Federal funding. Avoid the use of state and County monies (which are based on property and income taxes). **Implement this plan in the most cost effective manner, using alternatives which remove the most phosphorus per dollar expended.**				
Action 7: Fund a coordinator(s) to oversee implementation of this plan.		DEQ,EPA, CDA Tribe, CLCC,KC, BC,SC		
Action 8: Form a private foundation to seek implementation funding.				
Action 9: Contract with a stormwater hydrologist for technical support for jurisdictions developing and enforcing stormwater management ordinances for the Basin.		KC, BC, DEQ		

Action 10: Revise state Water Quality Standards for the Cd'A Basin, to make them less ambiguous, more enforceable, and more effective at preventing sediment, phosphorus and other contaminants from entering Lake Cd'A and its tributaries. a) Develop erosion control, stormwater management, road maintenance and vegetative buffer (if needed) requirements and BMP's for the Cd'A Basin and reference them in the Water Quality Standards. b) Develop broader, more proactive standards which will prevent the loss of beneficial uses and ensure that those uses are maintained for future generations. Use common terms and explanations to clarify the intent of ambiguous or technical sections of the Standards. c) Expand sediment criteria for domestic water supplies, to include Lake Cd'A and any tributaries with 15 or more homes using the water for domestic purposes (i.e. drinking water). d) Evaluate and if necessary make improvements to the enforcement provisions of the Standards.	1	DEQ,CT		State of Idaho

Notes:

Action 1 - The purpose of this action is to minimize duplication and assure that publicly funded monitoring projects produce compatible data which can be used by all agencies, for different projects. For example, if two agencies are conducting monitoring in the same location, they may be able reduce transportation and salary expenses by having one individual collect samples for both agencies.

Action 4 - Present Kootenai County with a copy of this plan as soon as possible so that they may incorporate it into their new zoning ordinance. Also present Shoshone County, Benewah County, the CDA Tribe and others with a copy so they may start incorporating this plan into their regulations and ordinances.

Action 6 and 7 - Implementation oversight should be provided by a Board consisting, at a minimum, of representatives of DEQ, EPA, the Coeur d'Alene Tribe, and Kootenai, Benewah and Shoshone Counties. A mechanism should also be developed to keep citizens involved in plan implementation.

Action 10 -

a. Include all stakeholders in the development of these requirements and BMP s.

b. For example, develop sediment standards which apply to all tributaries, and which are designed to minimize the quantity of sediment reaching the lake (and thus prevent unacceptable changes to lake water quality and beneficial uses). Sediment criteria for fish and drinking water systems should be retained, but should be supplemented by a broader, basin wide standard.

Table 28a. Management actions recommended by recreation subgroup of the development technical advisory group.

Public Education **Goal: Provide for enjoyable, recreational experiences on the lake while promoting water quality protection and safety.**	**Priority**	**Lead**	**Estimated Cost**	**Funding Sources**
Action 1: Promote and support implementation of Ordinance No. 140-A, which regulates boat wakes.	1	KC		
Action 2: Develop education materials regarding setback and containment of campfires on beaches, etc.	1	CLCC		

Table 28b. Gray and Black Water Disposal Options	Priority	Lead	Estimated Cost	Funding Sources
Action 1: Develop pamphlet describing proper disposal at pump-out stations. Encourage operator instruction.	1	CLCC		
Action 2: Develop a current comprehensive map of all the pump-out station locations.	1	CLCC, PHD		
Action 3: Encourage increased number of pump-out stations at marina locations. (It was suggested that marinas may wish to charge a pump-out fee or a discount with gasoline purchase, for example.)	1	BC,KC, PHD		
Action 4: Promote installation of sealed disposal systems for grey water.	1	PHD		
Action 5: Promote the use and funding for waterborne outhouses on the lake.	2	IDPR		
Action 6: Require holding tanks for gray water disposal for new manufactured boats.		KC, BC, USCG		

Table 28c. Industrial Uses on the Lake	Priority	Lead	Estimated Cost	Funding Sources
Action 1: Examine impact of industrial uses on the lake. Such as log transport, evaluate impacts of log transport and storage. Examine the logging operations (storage on the lake), as these effect nutrient levels.	2	IDL,DEQ		
Action 2: Develop support for public land managers of recreation sites contaminated with metals (IDFG, IDPR, USFS, BLM) to develop barriers between the public and metals and to provide sources of potable water.	1	IDFG,BLM USFS, IDPR		

to the lakebed sediments;

4) Manual, biological, and bottom barriers-these alternatives were dismissed because the large area to be treated was beyond their scope of application;

5) Rotovation-this alternative was closely considered but was eventually dismissed because it dramatically disturbs the lakebed sediments, releases nutrients into the water column, and its production of suspended sediment adversely affects spawning and migration of fish.

6) Mechanical harvesting-this alternative was chosen because it removes harvested plants and their associated nutrients from the lake, has a lesser impact on fish and other organisms, and should promote the leaching of nutrients from the sediment to establish some nutrient equilibrium in the future. The southern lake action items appear in table 29.

RIVERS

After familiarizing itself with the key issues pertaining to the rivers, river TAG participants identified bank erosion, permitting, and weed growth as the problems to be addressed. The group recognized that bank stabilization is necessary to curtail erosion and accompanying nutrient yield from both rivers. An inventory is necessary to develop priorities (action item 1). The technically simple approach of limiting boat size and speed was discussed. The group felt political support for the approach could not be developed. An educational program covering damage by boat wakes was requested (action item 2). Bank stabilization will require considerable funding. Action item 3 was designed to raise funds from users. Bank stabilization over the considerable mileage of the two rivers will be required. Development of a standard inexpensive method, to accomplish this is required (action item 4). The St. Joe River has less drastic erosion problems located primarily on undeveloped banks. Action item 5 recognized revetments use as a promising approach, the effectiveness of which should be demonstrated. Action item 6 directs bank stabilization as funds are available, recognizing that priorities must be set in completion of the work. The active participation in stabilization efforts of state and federal land managers who control a large part of the river frontage is sought in action item 7. In its numerous discussions of bank erosion of the Coeur d'Alene River, the work group was unable to assess the value of bank stabilization in reducing metals loading to the river and the lake. Although bank erosion is one mechanism, others have been identified and their relative contributions to the metals load is not understood. As a result, action item 8 requests a study of the amount of metals loading from the various loading mechanisms with consideration of the effect of different management approaches.

Problems with obtaining permits has prevented voluntarily bank stabilization work. A standard mechanism for permitting small stabilization projects exists. A pamphlet should be produced to educate the public about the permits available and suggests acceptable standardized methods. Although weed growth along the river is a local problem, the group found no economic means to address it. The management actions recommended by the rivers TAG are listed in Table 30.

Table 29. Management actions recommended by southern lake technical advisory group.

Southern Lake Management Actions **Goal: Reduce nutrient loading to the Southern Lake in the Most effective and cost efficient manner.**	Priority	Lead	Estimated Cost	Funding Sources
Reduction of Nutrient Load in Lake Bed Sediments Action 1: Slowly reduce nutrient load by systematically harvesting macrophytes. Investigate and implement mechanical harvest for co-generation, fertilization, compost or methanol production.	1	Tribe, DEQ, I&FG, IP&R, I.D.L., CLCC	'	Tribe, Federal Program, Develop Corp, Panhandle area Council Dept. of Commerce, Parks & Rec. User fee of $3/boat
Reduce sediment/nutrients loading from river/lake bank erosion. Action 2: Control bank & bottoms sedimentation by expanding and enforcing no-wake zones, controlling log boom scower and managing the size and speed of boats.		Counties IP.&R., Corp. of Eng., I.D.L.		Coast Guard Grant, County Fees

The Southern Lake Technical Advisory Group recommends to the Lake Planning Workgroup that the only action item that should be considered is the development of an "Integrated Aquatic Plant Management Plan". The emphasis of the "Plan" should focus on removal of aquatic plants from the Southern Lake by means of Mechanical Harvesting. During the scoping process many alternatives were considered and dismissed for various reasons but primarily because of environmental impacts. Methods of aquatic plant management that were considered including moving, biological control, bottom barriers, rotovating, dredging, herbicides, and mechanical harvesting. Because of the size and complexity of the Southern Lake, a combination of some of the above mentioned methods most likely will need to be addressed in the "Plan".

BENEFITS OF MANAGEMENT ACTIONS FOR NEARSHORE ZONE

OVERVIEW OF WATER QUALITY ISSUES AND MANAGEMENT GOALS

Within the nearshore zone, water quality issues include, but are not limited to:

- control of excessive periphyton growth,
- control of excessive growth of aquatic macrophytes,
- reduction of bacterial contamination, protection of drinking water withdrawn from the lake,
- stabilization of heavy metals, and lake level fluctuations.

The designated beneficial uses include domestic water supply, agricultural water supply, cold water biota, salmonid spawning, primary contact recreation, and secondary contract recreation. The water quality conditions measured during the 1991-93 lake study indicate these beneficial uses are not fully supported, because of aquatic biota criteria are exceeded for zinc. Impact to aquatic biota has been demonstrated only in the case of phytoplankton growth inhibition. Drinking water standards which are enforced at the tap are being met in the raw water.

In the past few years, there has been a major increase in the conversion to residential use of lands adjacent to the lake. The nearshore population has also increased rapidly, not only as new residences are built, but as existing residences are converted from seasonal to year round usage. This recent development of the nearshore area may be detrimental to the recent trend of improved lake water quality because the conversion of an acre of forest land to urban use can increase phosphorus runoff by a factor of 5 to 20 times (U.S. Environmental Protection Agency, 1990).

Another impact on lake water quality is from leachates from nearshore septic tank systems. Older systems most likely contribute more nutrients to lakes than new system and may continue to leach nutrients for many years after abandonment. The actual effects of these systems on nearshore water quality can only be assessed after additional study because the scope of the 1991-93 lake study precluded an in-depth evaluation. Upgrade costs may be substantial. Thus, the benefits to nearshore water quality will need to be accurately assessed to determine the relation of costs to benefits. A comprehensive assessment of nearshore sewage disposal requirements and plans is probably warranted (similar to that being conducted on the Spokane River). The question of whether or not new growth should bear the cost of upgrading old septic tank systems, based on the concept of pollution trading, needs to be addressed.

The majority of public comments during the April 1994 public meetings favored a goal of "slow improvement" for the nearshore zone instead of the alternative goal of "rapid improvement." The goals of "no action" and "maintain current conditions" were not legally viable because of violations of water quality criteria and standards.

If no actions were taken, then water quality likely would deteriorate further, especially in nearshore areas receiving increased sediment and nutrient runoff from intensive

Table 30. Management actions recommended by rivers technical advisory group.

Bank Erosion/Stabilization Actions **Goal: Reduce accelerated stream bank erosion on the lower St. Joe by 25% and Coeur d'Alene River by 50% over the next decade.**	**Priority**	**Lead Agency(s)**	**Estimated Cost**	**Funding Source**
Action 1: Inventory rapidly and moderately eroding banks in the slackwater reaches of the Coeur d'Alene (CdA) and St, Joe banks.	1	DEQ USGS	minimal	Current monitoring resources
Action 2: Develop an informational pamphlet for distribution to boat registrants education them on the damage caused by boat wakes to river banks.	1	CBRP	$2,500	CBRP Public Education Budget
Action 3: Develop and support legislation enabling counties to assess user fees dedicated to lake protection activities including bank stabilization.	1	CBRP, CAC,local legislators	minimal	CBRP mechanism counties
Action 4: Develop a standardized and cost efficient bank stabilization method for eroding Coeur d'Alene River banks.	1	ACOE,IDWR,IDL,DEQ, IDFG, USF&WS	minimal	Agency budgets
Action 5: Develop a log or tree revetment demonstration project for undeveloped banks of the St. Joe River. Log or tree revetments are logs or trees placed and anchored under an undercut bank to absorb the wave energy and resist further bank undercutting.	1	CBRP Cooperating agencies	$8,000	CBRP, DEQ, EPA
Action 6: Armor and vegetate rapidly eroding banks as budget allows according to priorities of Rivers TAG (list). Priorities will be established after the bank erosion inventory is completed.	1	ACOE, IDL, IDWR, IDFG, & DEQ	$1,000,000±	Federal Grants State WPCA Users Fees counties
Action 7: Develop support for public land managers (IDFG, IDL, USFS, BLM) to implement bank stabilization on the public lands. Armor banks at all existing recreation sites and any new sites developed.	1	CBRP, CAC	minimal	CBRP mechanism

Action 8: Identify sources of trace (heavy) metal loads in the CdA River between Cataldo and Harrison with special attention to: a) Need for tailings removal from banks or channel b) Advantage of stabilizing water levels in the river or its wetlands. c) Assess if bank stabilization will be effective in curtailing metals loading. d) Monitoring of the bank erosion rate.	2	USGS, NRDA, Trustees, DEQ, CBRP, WWP	$75,000	Federal grants State WPCA

Bank Stabilization Permit Actions **Goal: Educate private landowners and governmental managers engaged in bank stabilization on the St. Joe and Coeur d'Alene Rivers on the nationwide permit available, stabilization guidelines and suggested approaches.**	Priority	Lead Agency(s)	Estimated Cost	Funding Source
Action 1: Develop a pamphlet explaining the Army Corp of Engineers bank stabilization permit, stabilization design features and recommendations on methods to develop beach and wildlife areas.	1	ACOE, IDWR, IDL, DEQ, IDFG, USF & WS	$2,500	CBRP mechanism

development. In order to maintain current conditions, measures would need to be implemented to reduce sediment and nutrient runoff from existing and new development.

If the goal of "rapid improvement" had been chosen, then an aggressive program of BMPs and ordinances would be necessary, especially in nearshore areas already exhibiting serious water quality problems such as Kid Island Bay. In such cases, it would be advisable to form watershed "forums" to address the specific water quality issues and how best to deal with them.

WATER QUALITY MANAGEMENT GOAL: IMPROVE SLOWLY

The goal of "slow improvement" in the nearshore zone is to be achieved with management actions developed by the TAGs for forest practices (table 22), agriculture (table 23), and development (tables 24-27). The development TAG presented its management actions under four categories: stormwater (table 24), roads (table 25), wastewater (table 26), and miscellaneous topics (table 27).

The water quality impacts on the nearshore zone largely emanated from the addition of sediment and associated nutrients eroded from small watersheds that border the lake. Therefore, the majority of management actions for the nearshore zone are aimed at erosion control within those small watersheds; addressed primarily with management actions for stormwater (table 24), roads (table 25), and agriculture (table 23). Water quality in the nearshore zone is also affected by nutrient loadings delivered to the lake by the Coeur d'Alene and St. Joe Rivers. Management actions for erosion control within these two large watersheds are listed under forest practices (table 22) and agriculture (table 23).

Nutrients contained in wastewater also affect water quality in the nearshore zone. Management actions for wastewater (table 26) deal with discharges from nearshore domestic sources as well as municipal wastewater treatment plants on the Coeur d'Alene and St. Joe Rivers. Reductions in nutrient loadings from nearshore domestic sources could be achieved through a combination of actions: upgrading or replacement of older septic tank systems, improved maintenance and inspections, public education, and a ban on phosphate detergents. For municipal systems, the total maximum daily load (TMDL) process would be used to evaluate the efficacy of nutrient load reductions, with an early emphasis on the treatment plant at Page. Upgrades of domestic and/or municipal systems might be funded in part via pollution trading and/or credits whereby new sources of nutrient loadings may mitigate their impact by funding equivalent reductions from existing loading sources.

The 1991-93 lake study identified the nearshore areas of the following bays as having abundant growths of aquatic macrophytes: Carey, Carlin, Cougar, Kid Island, Loffs, Mica, Powderhorn, Rockford, 16 to 1, Windy, and Wolf Lodge Bay (eastern end). The plant biomass could be harvested periodically with mechanical harvesting equipment, in cases where macrophytes interfere with aesthetics and boat traffic. This management action and its environmental considerations are discussed in more detail in a later section on the shallow, southern lake zone.

The foregoing discussion of management

actions dealt with nutrients and biological production; however, the nearshore zone also suffers from zinc concentrations that exceed federal water quality criteria. The reduction of zinc concentrations in this zone will be largely dependent on activities conducted within the Coeur d'Alene River Basin. With this management plan are management actions geared to reduce erosion of zinc-bearing sediments in the lower reaches of the Coeur d'Alene River. The ongoing cleanup of the Bunker Hill Superfund Site should result in reduced loadings of zinc to the lake. The Coeur d'Alene Basin Restoration Project has planned numerous mining-related remediation projects within the South Fork Coeur d'Alene River. These should also reduce zinc loadings to the lake.

The management actions for the nearshore zone are intended to attain, within the next decade, the desired water quality conditions for concentrations of dissolved oxygen, total phosphorus, and zinc, clarity, and coliform bacteria counts listed in Table 31. Table 31 compares the desired conditions to those measured during the 1991-93 lake study and any applicable legal-based standards. For dissolved oxygen concentration and clarity, the current conditions have already attained the desired condition. Current concentrations of total phosphorus and zinc exceed the desired condition.

BENEFITS OF MANAGEMENT ACTIONS FOR SHALLOW, SOUTHERN LAKE ZONE

OVERVIEW OF WATER QUALITY ISSUES AND MANAGEMENT GOALS

Within the shallow, southern lake zone, water quality issues include, but are not limited to:

- reversing the depletion of dissolved oxygen,
- stabilization of highly enriched heavy metals in the lakebed,
- potential toxicity of heavy metals to aquatic biota in the lakebed and lake water,
- control of sedimentation,
- improvement of water clarity, and
- control excessive growth of aquatic plants.

The heavy metal concerns are restricted to the area north of Conkling Point.

The designated beneficial uses include domestic water supply, agricultural water supply, cold water biota, salmonid spawning, primary contact recreation, and secondary contact recreation. The water quality conditions measured in the shallow, southern lake zone during the 1991-93 lake study indicate the beneficial use for cold water biota is not supported during the warm months because dissolved oxygen is well below 6 milligrams per liter during the summer. The federal water quality criteria

Table 31 Numeric Values for current, desired, and criteria/standards-based water-quality conditions in the deep, **nearshore management zone.**

	Desired Condition[11]	Current Condition[1]	Standard or Recommended Level[10]
Dissolved Oxygen (mg/L)[2]	8.6	8.6	6.0[3]
Total P (ug/L)(ppb)[2]	5-10	5.0[8]	25.0
Zinc(ug/L)(ppb)[2]	32.7	56	32.7
Clarity (Secchi depth meters)	7.6	7.6[4]	none
Coliform bacteria	500/100 ml	-	500/100 ml[5]
	200/100 ml	-	200/100 ml[6]
	50/100 ml	-	50/100 ml[7]

1. Average condition of 19 bays unless otherwise noted.
2. Seven day average.
3. Standard applies to all waters except the lowest 7 meters of the water column at depths greater than 35 meters.
4. Average of 19 bays 7.6 meters; worst case Fuller's 5.2 meters.
5. At any time.
6. In no more than 10% of the samples taken over a 30 day period.
7. Geometric mean of samples taken over a 30 day period.
8. Average total phosphorus for 19 bays over two years; worst case, Kidd Island Bay, 16 ug/L.
9. Average of 19 bays; worst case Kidd Island Bay, 150/100ml.
10. Standard based Idaho Water Quality Standards and waste water treatment requirements, EPA "Gold Book" criteria (as interpreted by National Toxic Rule) or phosphorus levels recommended to prohibit nucience aquatic weed growth.
11. Based on interpretation of Idaho Antidegradation policy and special resource waters designation of lake Coeur d'Alene.

are not met because of potential toxicity of zinc to aquatic biota.

This lake zone receives inflow from the St. Joe River and several small watersheds with significant agricultural development, such as Plummer and Benewah Creeks. The influence of the St. Joe River is muted within Chatcolet, Benewah, and Round Lakes because levees channel its flow nearly to Conkling Point. The major water quality problem in the Plummer Creek drainage is nutrient and sediment loading from non-irrigated agricultural and silvicultural activities conducted on highly erodible lands. Plummer Creek also receives runoff from urban and industrial areas, a confined hog operation, and other livestock grazing. The wastewater treatment plant for the city of Plummer is also in the drainage. Past and present land management activities in the drainage have produced significant adverse effects on receiving lake waters (Benewah Soil and Water Conservation District, 1990). Benewah Creek has similar water quality problems, but to a lesser extent than Plummer Creek.

This zone of the lake is different from the other three because in-lake processes are important determinants of biological production. When Post Falls Dam raised the lake level in 1906, the extensive wetlands in this zone became lakes. Their lakebeds were formerly fertile wetland and marshy soils. The lakebeds have been further enriched by the annual die-off of aquatic plants that inhabit a large percentage of this zone's area. Nutrients are released from the lakebed sediments. When dissolved oxygen is depleted, sometimes completely, it creates reducing conditions within the lakebed, which greatly increase the rate of release. This process is termed "internal fertilization" and usually requires in-lake remediation techniques to circumvent it. The aquatic plants also add nutrients to the lake via "nutrient pumping" when, during their growing season, they obtain nutrients from the lakebed and subsequently release nutrients into the lake water through their tissues. The shallowness of these lakes can also allow resuspension of lakebed sediments by wind-induced or boat-induced turbulence.

The aquatic plants play an important role in the water quality problems in this zone. However, their presence is not totally negative. Wild rice has become so abundant in Benewah Lake that it is commercially harvested. Excessive plant growth is also occurring in Round Lake where commercial wild rice harvest has also been proposed. Although shallow open-water areas are being overgrown by aquatic plants, additional waterfowl and fishery habitat is being gained. The aquatic plant beds are important nursery areas for young-of-the-year fish. Remediation techniques affecting these plants should consider the potentially negative effects on fishery production.

The majority of public comments during the April 1994 public meetings favored a goal of "slow improvement" for the shallow, southern lake zone instead of the alternative goal of "rapid improvement." The goals of "no action" and "maintain current conditions" were not legally viable because of violations of water quality criteria and standards.

If no actions were taken to improve water quality, then water quality problems would worsen, particularly in the areas with excessive aquatic plants. Sedimentation

would worsen via two processes: trapping of inflowing sediment by aquatic plants and buildup of dead plants on the lakebed. Dissolved oxygen depletion would worsen as the organic and nutrient content of the lakebed sediments was increased by sedimentation from the watershed and annual die-off of aquatic plants. Given enough time, the shallow lake areas will revert to wetlands.

In order to maintain current conditions, sediment and nutrient loads from the watershed would need to be reduced to counter the stimulatory effects of increasing aquatic plant growth. Plant growth rates would be unlikely to respond to reduced external nutrient loads because they derive much of their nutrient input from the lakebed sediments. Therefore, limited harvesting of aquatic plants could be employed to reduce the accrual of organic matter to the lakebed.

If the goal of "rapid improvement" had been selected, then the watershed actions suggested for the "slow improvement" goal would need to be implemented. The in-lake treatment would involve dredging the lakebed sediments instead of macrophyte harvesting. Dredging depth would need to be sufficient to remove the root zone of the aquatic plants. After dredging, periodic applications of alum could be applied to scavenge nutrients from the water column.

WATER QUALITY MANAGEMENT GOAL: IMPROVE SLOWLY

The goal of "slow improvement" in the shallow, southern lake zone is to be achieved, in part, by reducing nutrient loads from the lakebed sediments and erosion of riverbanks and lake shorelines, as recommended by the southern lake technical advisory group (table 29). Management actions will be applied to contributing watersheds to reduce nutrient loadings from point and nonpoint sources.

The reductions in nutrient loads from lakebed sediments will be accomplished by systematic mechanical harvesting of aquatic macrophytes. The harvested biomass might be utilized for cogeneration and production of fertilizer, compost, and methanol. The design of the harvesting program will require additional data on the spatial distribution, species composition, and nutrient content of the macrophytes within the four southern lakes. Consultation with manufacturers of macrophyte harvesting equipment is strongly encouraged. An introduction to the methodology is contained in Cooke, and others (1993). Because of potentially adverse effects of macrophyte harvest on fish production and waterfowl habitat, consultation will be necessary with the Idaho Departments of Fish and Game and Parks and Recreation, and the U.S. Fish and Wildlife Service.

The reductions in nutrient loads from contributing watersheds are to be accomplished through a variety of measures (table 29) including application of BMPs to agricultural and forested lands and stormwater management. The forest practices and agriculture TAGs list numerous BMPs (tables 22 and 23) that could be implemented for the southern lake management zone. Additional guidance is also available from the Agricultural Pollution Abatement Plans for the Plummer Creek (Benewah Soil and Water Conservation District, 1990) and Lake Creek (Kootenai-Shoshone Soil Conservation District, 1991) watersheds, recently completed as part of the

state Agricultural Water Pollution Control Program. Stormwater management recommendations were addressed in detail within the development TAG (table 24). Additional reductions in nutrient loads could also be realized by upgrading wastewater treatment plants at municipal and industrial point-source dischargers and by treating the discharges from field drainage systems bordering the lower St. Joe River.

The Coeur d'Alene Tribe's reservation occupies a substantial portion of the small drainage basins that drain to the southern lake zone. The Tribe is nearing completion on two assessment reports which address point and nonpoint source pollution on tribal lands (written commun., Chris Hardy, Coeur d'Alene tribal hydrologist). The first report assesses nonpoint source pollution on the reservation and prescribes a management plan for its reduction. The second presents an evaluation of point source pollution from NPDES-permitted dischargers on the reservation.

The reduction of nutrient loads from the erosion of riverbank and lake shorelines is based largely on regulatory control of boat-induced erosion. The southern lake TAG recommended expansion and enforcement of "no wake" zones coupled with management of the number, size, and speed of boats using the southern lake area. They also recommended the installation of protective log booms. The rivers TAG listed a number of bank protection measures and permitting policies (table 30) that are applicable to the southern lake zone.

The water quality management action items recommended for the southern lake zone are designed to slowly reduce the nutrient content and biological productivity of this zone. During the initial phase of implementation, it is likely that the dissolved oxygen deficit will continue to create violations of water quality standards. It may be advisable to artificially aerate the hypolimnion of Chatcolet Lake to maintain late summer dissolved oxygen concentrations above 6 milligrams per liter. This management technique has been extensively applied; an introduction to the methodology is contained in Cooke, and others (1993).

In order to satisfy federal water quality criteria, zinc concentrations in this zone need to be reduced, specifically, in the area north of Conkling Point. The management actions recommended for zinc reductions were previously discussed in the section on the nearshore zone.

The management actions for the shallow, southern lake zone are intended to attain, within the next decade, the desired water quality conditions for concentrations of dissolved oxygen, total phosphorus, and zinc, and clarity listed in Table 32. Table 32 compares the desired conditions to those measured during the 1991-93 lake study and any applicable legal-based standards. Current conditions for the four variables do not meet the desired conditions.

Table 32 Numeric Values for current, desired, and criteria/standards-based water-quality conditions in the shallow, **southern-lake management zone.**

	Desired Condition[6]	Current Condition[1]	Standard or Recommended Levels
Dissolved Oxygen (mg/L)[2]	8.4	8.4	6.0
Total P (ug/L)[2]	12.0	18.3[4]	25.0[5]
Zinc(ug/L)(ppb)[2,3]	32.7	39.0	32.7
Clarity (Secchi depth meters)	4.0	3.0	none

1. Average of Chatcolet and Blue Point Stations unless otherwise noted.
2. Seven day average.
3. Applies to area of southern lake north of Conkling Point.
4. Average total phosphorous = 18.3 ug/L; worst case Chatcolet Lake 26.9 ug/L.
5. Standard based on Idaho water quality standards and wastewater treatment requirements, EPA "Gold Book" criteria (as interpreted by National Toxic Rule) or phosphorus levels recommended to prohibit nucience aquatic weed growth.
6. Based on interpretation of Idaho Antidegradation policy and special resource water designations of lake Coeur d'Alene.

BENEFITS OF MANAGEMENT ACTIONS FOR LOWER RIVER ZONE

OVERVIEW OF WATER QUALITY ISSUES AND MANAGEMENT GOALS

Within the lower rivers zone, water quality issues common to the lower reaches of the two rivers include:

- reduction of bank erosion,
- control of nutrient enrichment from point and nonpoint sources,
- control of excessive growth of aquatic plants, and
- reduction of bacterial contamination.

For the Coeur d'Alene River, heavy metal contamination of the riverbank sediments and water is an additional concern. The designated beneficial uses for the lower reaches include agricultural water supply, cold water biota, primary contact recreation, and secondary contact recreation. The water quality conditions measured in the lower rivers zone during the 1991-93 lake study indicate these beneficial uses are not fully supported for the Coeur d'Alene River because of metal criteria exceedences, they are fully supported for the St. Joe River. Water quality criteria for cadmium, copper, lead, and zinc are not being met in the lower reach of the Coeur d'Alene River. The drinking water standard which applies at the tap for lead also is not met in that reach.

River bank erosion has accelerated on the mainstem Coeur d'Alene River over the last two decades (Natural Resource Conservation Service, 1994a,b). Ironically, this effect may be related in part to installation in the late 1960's of settling basins for mining and smelting wastes. By reducing the sediment load of the river, its overall sediment transport capacity was increased. The river satisfied this additional transport capacity by eroding its banks which contain previously deposited mine wastes. The effect of boat wakes also contributes significantly to river bank erosion. In 1991, as many as 1,000 boats per weekend passed an observation point downstream of the Cataldo Mission (Natural Resource Conservation Service, 1994a,b). Lake level fluctuations also play a role in bank erosion. If the lake level is reduced too rapidly, then hydrostatic pressure in the riverbanks, which were recently underwater, may be sufficiently high to slough part of the bank into the river. The alternate wetting and dewatering may also affect geochemical process within the banks and promote leaching of dissolved heavy metals into the river.

River bank erosion also is a major concern on the lower St. Joe River. The natural levee banks separating the river from Chatcolet, Round and Hidden Lakes appear to have eroded significantly and at an increasing rate in the last half century; the separation between Chatcolet and Round lakes is now nearly nonexistent when Coeur d'Alene Lake is at full pool. The detrimental effects on the levees caused by lake level fluctuations were noted as early as 1921 (Davenport, 1921). Lake level fluctuations for hydropower production and flood control have probably contributed significantly to this process by: 1) raising the water table in the channel banks so that large stabilizing vegetation (such as the once-abundant cottonwoods) could no longer survive; and 2) raising the level of Chatcolet Lake, resulting

in higher wave energy and more sustained wave action which eroded the original channel levees (personal communication, 1994, Steve Foster, Corps of Engineers).

The majority of public comments during the April 1994 public meetings favored a goal of "slow improvement" for the lower rivers zone instead of the alternative goal of "rapid improvement." The goals of "no action" and "maintain current conditions" were not legally viable because of violations of water quality criteria and standards.

If no actions were taken, then natural processes would eventually erode the contaminated river bank materials into the lake. The period of time required for such natural cleansing is unknown, but might be estimated with a sediment transport model and additional information on the amount of contaminated sediments stored in the riverbanks. Such information is being collected by the U.S. Geological Survey as part of the Coeur d'Alene Basin Natural Resource Damage Assessment.

In order to maintain current conditions some form of institutional controls may be needed. One option is to place limits on the number, size, and speed of boats allowed to use the lower reaches of the two rivers. This option would be politically volatile, but may be one of the least expensive to implement. Problem areas might be identified through field studies so that riverbank stabilization projects could be implemented. Such projects might focus on plantings of vegetation and installation of log shields to protect the banks from wave erosion.

If the goal of "rapid improvement" had been chosen, the management options would have included streambank stabilization techniques ranging from biotechnology through riprapping. Application of these potentially costly options would require additional hydrologic and engineering studies, probably in cooperation with the Corps of Engineers. Another option would involve altering the timing and rates of lake level drawdown, but would require extensive negotiations with Washington Water Power and other parties responsible for flood control within the Columbia River Basin. Specific to the Coeur d'Alene River is the option to remove the metals contaminated riverbank sediments and replace them with clean material. This option would be very costly, but would eliminate a major source of metals contaminated sediment to the lake.

WATER QUALITY MANAGEMENT GOAL: IMPROVE SLOWLY

In order to meet the goal of "slow improvement" in the lower rivers zone, the rivers TAG recommended that over the next decade accelerated streambank erosion in the St. Joe be reduced by 25 percent, whereas it should be reduced by 50 percent in the Coeur d'Alene River. Attainment of these goals is to be achieved via a combination of approaches (table 30). An initial requirement is for better knowledge of the location and severity of streambank erosion in the two rivers. Based on that, stabilization projects could be designed and tested as to their efficacy and cost. Institutional support for and funding of the projects would need to be established, possibly through user fees. Public education would be used to inform boat operators of ways they could reduce their negative impacts on streambanks. An informational pamphlet would be developed to educate private landowners of streambanks

and governmental managers in proper methods of streambank stabilization.

The recently completed Natural Resource Conservation Service study of the Coeur d'Alene River Basin assessed the extent of stream bank erosion in the lower river and suggested a variety of remediation methods (Natural Resource Conservation Service, 1994a,b).

These suggestions, developed in conjunction with the U.S. Army Corps of Engineers, are summarized as follow:

- Limit power boat use on the river, this could include limits on motor horsepower, boat size, or boat speed. Provide additional boat ramps and access. Ban power boats from the river.

- Lake level management would help reduce variations and slow transitions, thereby allowing porewater pressures in streambanks to dissipate slowly to prevent spalling of streambanks.

- Watershed treatment and/or temporary storage for reduction of impacts from upstream runoff.

- Management alternatives such as vegetation plantings and livestock management on lands adjacent to the river.

- Bypass "hot spots" of metal contamination with channelization.

- Deepen channels in aggrading (depositional) areas, especially on the North Fork, to provide a non-contaminated sediment source to cover the contaminated sediments of the main river.

- Uncontaminated soil could be used as fill material between the top of the banks and the existing bank slopes; a protective vegetative cover could then be established.

- Contaminated sediment could be removed and banks resloped and stabilized. This would depend on the amount of material involved, EPA hazardous waste regulations, and identification of suitable disposal sites.

- Construct rock bank protection from the summer water level down a minimum of five feet or below the normal winter low water level.

- Start riprap projects on highest priority areas, beginning with outside bends and trailing banks, straight sections next, and inside bends last. Priorities should also be based on the severity of contamination.

- "Do nothing" approach and try to determine how long for natural stabilization and how much volume will be removed during this process.

The knowledge gained from the Natural Resource Conservation Service's river basin study has been of great value in identifying problems and potential solutions for that river. A similar assessment of the St Joe River, including the St. Maries River, would also be of great value because the St. Joe

River is now the largest loading source of nutrients for Coeur d'Alene Lake.

BENEFITS OF MANAGEMENT ACTIONS FOR DEEP, OPEN WATER ZONE

OVERVIEW OF WATER QUALITY ISSUES AND MANAGEMENT GOALS

With the deep, open water zone, water quality issues include, but are not limited to:

- recovering depletion of dissolved oxygen,
- stabilizing highly-enriched heavy metals in the lakebed, and
- potential toxicity of heavy metals to aquatic biota in the lakebed and lake water.

The designated beneficial uses are domestic water supply, agricultural water supply, cold water biota, salmonid spawning, primary contact recreation, and secondary contact recreation. The water quality conditions measured in the deep, open-water zone during the 1991-93 lake study indicate these beneficial uses are not fully supported because of potential toxicity of zinc. The federal water quality criteria for cadmium, lead, and zinc are not being met because the concentrations near the lake bottom are exceeding acute and/or chronic criteria for aquatic biota. Impact to aquatic biota has been demonstrated only in the case of phytoplankton growth inhibition.

The majority of public comments during the April 1994 public meetings favored a goal of "slow improvement" for the deep, open water zone instead of the alternative goal of "rapid improvement." The goals of "no action" and "maintain current conditions" were not legally viable because of exceedences of water quality criteria.

If no actions were taken to improve water quality, then the recent improving trend might be reversed by gradual increases in nutrient loadings from existing and new point and nonpoint sources. In order to maintain current conditions, nutrient loads to the lake would need to be held at current levels. Such an action would require "pollution trading" to balance increases and decreases in nutrient loadings.

If the goal of "rapid improvement" had been chosen, then an aggressive program of nutrient reductions would have been needed to reduce the lake's biological productivity and, hence, its hypolimnetic dissolved oxygen deficit. Such a program would have required extensive implementation of BMPs throughout the basin, substantial reductions in nutrient loadings from municipal wastewater treatment plants and nearshore septic tank systems, and adoption of ordinances to closely manage the effects of new development on nutrient loadings to the lake. The management actions available for "rapid improvement" of heavy metal contamination of the lakebed would be quite limited and very costly. The obvious solution would be to remove the contaminated lakebed sediments by dredging. However, several factors argue strongly against this action. The cost could be on the order of tens, even hundreds, of millions of dollars. A suitable disposal site (most likely for legally designated hazardous substances) would have to be located. The dredging operations would probably cloud the lake and

the Spokane River downstream for a substantial period because the lakebed sediments are very fine grained. Additionally, the lakebed porewaters contain very high concentrations of dissolved metals that would be released into the lake and the Spokane River. Dredging would not be feasible until the source of contaminated sediments, the Coeur d'Alene River, had been remediated. Instead of dredging, the lakebed might be capped with clean sediment, with an estimated cost of tens of millions of dollars. However, the underlying contaminated sediments may continue to leach dissolved heavy metals into the clean capping sediments and ultimately contaminate them. As with dredging, remediation of the source of contaminated sediments would have to be done prior to capping, also at undoubtedly tremendous cost. It is remotely possible that future technological developments may make dredging and/or capping feasible, especially if metal recovery could partially defray the costs.

WATER QUALITY MANAGEMENT GOAL: IMPROVE SLOWLY

The deep, open water zone integrates the water quality effects of natural and human influences from throughout the basin; therefore, the goal of "slow improvement" in the deep, open water zone is to be achieved partially with management actions prescribed for the nearshore, southern lake, and lower river zones. The majority of the lake's nutrient loading is delivered by the Coeur d'Alene and St. Joe Rivers. Therefore, management actions implemented in those two basins are important for achieving the management goal.

Control of erosion and associated nutrients within the Coeur d'Alene and St. Joe basins is a major management action for this zone. Erosion control was addressed by the TAGs for forest practices (table 22), agriculture (table 23), and development (tables 24-27). Based on a recently-completed study of erosion in the Coeur d'Alene River basin (Natural Resource Conservation Service, 1994b), forest lands accounted for about two-thirds of the sediment load delivered by the Coeur d'Alene River to the lake; sediment input from agriculture was minimal. A similar situation likely applies to the St. Joe River Basin. The primary focus of erosion control in the Coeur d'Alene and St. Joe basins should therefore be on forest practices. The largest landholder in the basin, the U.S. Forest Service, had revised its land management philosophy to one more focused on managing watersheds and ecosystems as a whole. The Idaho Department of Lands, the agency responsible for enforcement of Idaho's Forest Practices Act, has developed a cumulative effects, or watershed management, approach for inclusion in the Forest Practices Act requirements. These two recent shifts in policy have the potential to substantially reduce erosion and thereby improve the quality of runoff from forest lands.

In contrast to timber harvest, the use of BMPs for agricultural activities is voluntary. Federal agricultural policies and programs and Idaho's state Agricultural Water Quality Program have reduced water quality degradation, particularly in specific project areas such as Lake Creek (Kootenai-Shoshone Soil Conservation District, 1991) and Plummer Creek (Benewah Soil and Water Conservation District, 1990). An expansion of such projects, coupled with

increased voluntary implementation of BMPs, would reduce sediment and nutrient loadings generated from agricultural lands.

Reductions of phosphorus loadings from municipal wastewater treatment plants in the Coeur d'Alene and St. Joe basins can also reduce nutrient loadings to the deep, open water zone. The construction of the South Fork Coeur d'Alene River Sewer District's wastewater treatment plant at Page was an important contribution toward improved water quality in the lake. However, this plant still contributes as much as one-quarter of the phosphorus load delivered by the Coeur d'Alene River to the lake. The costs of upgrading the Page plant and other municipal plants would be substantial. Those costs might be shared basinwide if the benefits accrue to the lake as a whole. One inexpensive means of reducing the phosphorus content of effluent from municipal plants is to curtail the use of phosphate-bearing detergents. Phosphate detergent bans have been enacted in neighboring counties and states and may have already reduced the availability of such detergents in the Coeur d'Alene Lake area. However, commercial and institutional detergents are exempt from such bans; further reductions in wastewater phosphorus loads could be achieved by encouraging the use of phosphate-free products in these sectors.

The foregoing management actions are designed to reduce nutrient concentrations and, hence, biological production in the deep, open water zone. These actions should reduce the lake's hypolimnetic dissolved oxygen deficit and, offer the most reasonable course of action for preventing the release of trace elements and nutrients out of the lakebed sediments into the overlying water column. This zone also suffers from water column concentrations of zinc that exceed federal water quality criteria. The reduction of zinc concentrations will be largely dependent on reducing zinc loadings from the Coeur d'Alene River basin. Management actions recommended by the rivers technical advisory group are geared to reduce erosion of zinc-bearing sediments in the lower reaches of the Coeur d'Alene River. Zinc loadings to the lake are also likely to be reduced by remediation activities underway or planned by the Bunker Hill Superfund Site cleanup and by the Coeur d'Alene Basin Restoration Project.

The management actions for the deep, open water zone are intended to attain, within the next decade, the desired water quality conditions for concentrations of dissolved oxygen, total phosphorus, and zinc, clarity, and coliform bacteria counts listed in Table 33. Table 33 compares the desired conditions to those measured during the 1991-93 lake study and any applicable legal-based standards. Zinc concentrations currently exceed the desired condition by a factor of 7.8. The current condition for dissolved oxygen and phosphorus concentrations as well as clarity have already attained the desired conditions; however, Idaho water quality standards for dissolved oxygen do not apply to the lower hypolimnion of lakes with depths greater than 35 meters.

Future improvements in water quality in the deep, open water zone might be more readily achieved if water quality management was coordinated by a lake basin commission. Because water quality improvements would likely occur cumulatively in small

Table 33 Numeric Values for current, desired, and criteria/standards-based water-quality conditions in the deep, **open-water management zone.**

	Desired Condition[9]	Current Condition[1]	Standard or Recommended Level[8]
Dissolved Oxygen (mg/L)[2]	7.0	7.0	6.0[3]
Total P (ug/L)(ppb)[2]	9.0	9.0	25.0
Zinc(ug/L)(ppb)[2]	32.7	143	32.7
Clarity (Secchi[2] depth meters)	6.0	6.0[4]	none
Coliform bacteria	500/100 ml	-	500/100 ml[5]
	200/100 ml	-	200/100 ml[6]
	50/100 ml	-	50/100 ml[7]

1. Average of values of Tubbs Hill, Wolf Lodge, Driftwood and University Point Stations.
2. Seven day average.
3. Standard applies to all waters except the lowest 7 meters of the water column at depths greater than 35 meters.
4. Worst case during winter runoff at University Point, Station 1.0 meters.
5. At any time.
6. In no more than 10% of the samples taken over a 30 day period.
7. Geometric mean of samples taken over a 30 day period.
8. Standard based on Idaho water quality standards and waste water treatment requirements EPA "Gold Book" criteria (as interpreted by National Toxic Rule) or phosphorus levels recommended to prohibit nucience aquatic weed growth.
9. Based on interpretation of Idaho Antidegradation policy and special resource water designation of lake Coeur d'Alene.

increments, the lake basin commission would provide coordinated management at the lake basin level. One important function that could be implemented and coordinated by a lake basin commission is an intensive public information and education program, which is a management action recommended by the TAGs for agriculture and development. Another important function would be to facilitate communication among the numerous entities that will be involved in planning and implementing management actions throughout the lake's drainage basin. For example, the Coeur d'Alene Tribe has recently developed specific management plans for control of point and nonpoint source pollution on their reservation. Such plans, and others, need to be integrated into an overall, basin wide approach to management of Coeur d'Alene Lake. The early stages necessary for the formation of a lake basin commission for the Coeur d'Alene basin have already occurred. Since the late 1980's, representatives of governmental agencies and public and private interest groups with responsibilities or interests in the basin have met regularly as the Coeur d'Alene Basin Interagency Group (CBIG). CBIG has served as a useful forum for informal discussion and coordination of basin wide issues and activities. CBIG could form the nucleus of a more formal approach to water quality management for the basin. The Coeur d'Alene Basin Restoration Project (CBRP) was recently formed by Idaho Division of Environmental Quality and the U.S. Environmental Protection Agency. Management of CBRP is shared by the two founding agencies and the Coeur d'Alene Tribe. At present, much of CBRP's focus is on restoration of areas in the South Fork Coeur d'Alene River damaged by mining activities. The activities of CBIG have recently been integrated with CBRP. Thus, the lake management plan for Coeur d'Alene Lake has become an important component of CBRP.

ENVIRONMENTAL EVALUATION

One potential source of funding to help implement this lake management plan is the U.S. Environmental Protection Agency's Clean Lakes Program. In order to qualify for this funding, a project must evaluate the potential for environmental impacts that may be caused by the project's management actions. Responses to the required questions for the environmental evaluation are listed as follows:

1. Will the proposed project displace any people? No.

2a. Will the proposed project deface existing residences or residential areas? No.

2b. What mitigative actions such as landscaping, screening, or buffer zones have been considered? Not applicable.

2c. Are they included? Not applicable.

3a. Will the proposed project be likely to lead to a change in established land use patterns, such as increased development pressure near the lake? Yes, the growth rate of nearshore development is likely to decrease.

3b. To what extent and how will this change be controlled through land use planning, zoning, or through other methods?

The majority of the decrease in growth rate will be implemented under Kootenai County's comprehensive plan.

4. Will the proposed project adversely affect a significant amount of prime agricultural land or agricultural operations on such land? Yes, voluntary implementation of BMPs will modify agricultural operations to some extent.

5. Will the proposed project result in a significant adverse effect on parkland, other public land, or lands of recognized scenic value? No.

6a. Has the State Historical Society or State Historical Preservation Officer been contacted? Not applicable.

6b. Has he responded, and if so, what was the nature of that response? Not applicable.

6c. Will the proposed project result in a significant adverse effect on lands or structures of historic, architectural, archaeological, or cultural value? No.

7. Will the proposed project lead to a significant long-range increase in energy demands? No.

8a. Will the proposed project result in significant and long-range adverse changes in ambient air quality or noise levels? No.

8b. Short term? No.

9a. If the proposed project involves the use of in-lake chemical treatment, what long and short term adverse effects can be expected from that treatment? Not applicable. 9.b. How will the project recipient mitigate these effects? Not applicable.

10. a. Does the proposal contain all the information the EPA requires in order to determine whether the project complies with Executive Order 11988 on floodplains? Yes.

10.b. Is the proposed project located in a floodplain? Yes, the lower rivers management zone includes the floodplains of the Coeur d'Alene and St. Joe Rivers.

10.c. If so, will the project involve construction of structures in the

floodplain? Yes, if riprap is installed on riverbanks.

10d. What steps will be taken to reduce the possible effects of flood damage to the project?
Riprap will be designed in consultation with the U.S. Army Corps of Engineers to minimize the potential for flood damage.

11a. If the project involves physically modifying the lake shore or its bed or its watershed, by dredging, for example, what steps will be taken to minimize any immediate and long term adverse effects of such activities? Not applicable.

11b. When dredging is employed, where will the dredged material be deposited, what can be expected, and what measures will the recipient employ to minimize any significant adverse impacts from its deposition? Not applicable.

12a. Does the project proposal contain all information that EPA requires in order to determine whether the project complies with Executive Order 11990 on wetlands? Yes.

12b. Will the proposed project have a significant adverse effect on fish and wildlife, or on wetlands, or any other wildlife habitat, especially those of endangered species? Yes, the harvesting of aquatic macrophytes in the southern lake zone and/or selected bays would remove fishery habitat and food sources for waterfowl. Endangered species habitat would not be significantly affected.

12c. How significant is this impact in relation to the local or regional critical habitat needs? Not significant.

12d. Have actions to mitigate habitat destruction been incorporated into the project? Yes, aquatic macrophyte harvesting would be designed in consultation with Idaho Department of Fish and Game and U.S. Fish and Wildlife Service.

12e. Has the recipient properly consulted with appropriate state and federal fish, game, and wildlife agencies and with the U.S. Fish and Wildlife Service? Planned, refer to 12d.

12f. What were their replies? Not applicable.

13. Describe any feasible alternatives to the proposed project in terms of environmental impacts, commitment of resources, public interest, and costs and why they were not proposed. Such information was discussed for each lake management zone under the sections entitled "Overview of water quality issues and management goals."

14. Describe other measures not discussed previously that are necessary to mitigate adverse environmental impacts resulting from the implementation of the proposed project. None.

MONITORING PLAN

The publicly-mandated goal of the Coeur d'Alene Lake Management Plan is to "improve water quality slowly" in each of the four water quality management zones. Numeric criteria were developed for several important water quality variables to help assess progress toward that goal as the plan's management actions are implemented. The numeric criteria are for concentrations of dissolved oxygen, total phosphorus, and zinc, clarity (secchi-disc transparency), and coliform bacteria counts; they are listed in Tables 31 to 33.

A monitoring plan has been designed that can be used to evaluate the effectiveness of management actions in attaining the management plan's goal. The monitoring plan is comprised of several elements:

1) periodic sampling of Coeur d'Alene Lake for index water quality variables;

2) addition of nutrient sampling at selected municipal wastewater treatment plants;

3) continuation of several existing monitoring programs; and

4) compilation of ancillary data for tracking trends that have the potential to affect water quality in the lake.

The sampling program for index variables in the lake is patterned after the 1991-93 lake study and focuses on variables with numeric criteria such as concentrations of dissolved oxygen, total phosphorus, and zinc, and clarity. The data collected by this phase of the monitoring plan represents the lake's response to loadings of nutrients and trace elements from its drainage basin. Reduction of dissolved oxygen deficits is a primary goal of the management plan. In the deep, open water zone, dissolved oxygen profiles should be measured monthly, beginning in mid summer and continuing until late autumn, in order to assess the yearly cycle of dissolved oxygen depletion within the hypolimnion at limnetic stations 1, 3, and 4 (figure 4).

Water temperature profiles and barometric pressure should be measured concurrently in order to compute percentage saturation of the dissolved oxygen concentrations. In the southern lake zone, the deficit develops earlier in the summer, therefore, profiles of dissolved oxygen and temperature should be measured monthly between early summer and early autumn. Additional samples should be taken during the dissolved oxygen profiling in order to assess trophic state trends. A composite sample of the euphotic zone should be analyzed for concentrations of total phosphorus, chlorophyll-a, and dissolved cadmium, lead and zinc, at a minimum.

Secchi disc transparency should be measured as an index of clarity and can then be multiplied by a factor of 2.5 to estimate euphotic zone depth. The nearshore zone should also be monitored by sampling at selected stations that represent a range of nutrient enrichment. Each nearshore station would be sampled in August for concentrations of total phosphorus and dissolved zinc; dissolved inorganic nitrogen analyses would be optional.

Several municipal wastewater treatment plants, permitted under the National Pollutant Discharge Elimination System (NPDES), were identified within the management plan as potential candidates for reductions of

nutrient loadings delivered to Coeur d'Alene Lake. Their current NPDES permits do not include monitoring of the phosphorus and nitrogen concentrations of their effluents. Such monitoring needs to be incorporated into their permits in order to track the trends in their loadings to the lake. If management actions are implemented at these plants to reduce nutrient loads, then the monitoring data can be used to assess the effectiveness of those actions.

Several monitoring programs already are operational at Coeur d'Alene Lake; they need to be continued and coordinated with new monitoring programs developed by this lake management plan. The Coeur d'Alene Tribe has recently implemented monitoring as part of its fisheries program. Their monitoring stations include Benewah, Chatcolet, Hidden, and Round Lakes and several nearshore stations within reservation boundaries.

The City of Coeur d'Alene's Wastewater Division has periodically measured dissolved oxygen and nutrients in a depression near the lake's outlet. Water quality at this station appears to be adversely affected by the long-term storage of logs in Cougar Bay. Continued monitoring is advisable and should be augmented with analyses of dissolved trace elements when dissolved oxygen concentrations are reduced to nearly anoxic levels, as has been recently measured. The Panhandle Health District is responsible for monitoring coliform bacteria in lake areas used by the public for primary and secondary contact recreation. This ongoing program could be expanded to include monitoring of additional nearshore areas with evidence of nutrient enrichment.

A primary purpose of monitoring is to assess trends and the effectiveness of management actions. In order to gain a better perspective on trends, the monitoring data should be evaluated in conjunction with information on other factors that can affect the variables being monitored. Often, this information is routinely available from ongoing, long-term programs. For example, additional scientific data includes precipitation, heat budgets, streamflow quantity and lake residence time, and unusual climatic or hydrologic events. Data on trends in demographics and economic development should be tracked to assess resource demands that may affect lake water quality. Specific examples of such data include building permits, septic system permits, and production figures for agriculture and timber harvest. The effectiveness of management actions will be assessed with monitoring data, but it is also important to monitor the implementation of management actions. A centralized data base can be established that contains information such as type of management action, its location, dates of implementation, and amount (acres of macrophytes harvested, length of streambank riprapped, length of riparian habitat fenced, etc.).

SUMMARY

Based on the results of the 1991-93 lake study, one can conclude that, at present, Coeur d'Alene Lake is an oligotrophic water body whose lakebed sediments contain highly enriched concentrations of trace elements. Historic data indicated the lake had received substantial loadings of nutrients and oxygen-demanding substances since the late 1800's. Beginning in the early 1970's, these loadings began to be reduced as municipal wastewater treatment plants became operational and forest practices and agriculture activities began to implement best management practices. As a result, the lake's trophic state shifted from mesotrophic to oligotrophic as the lake's biological productivity declined. That decline, coupled with the lake's large assimilative capacity for nutrients (determined by the nutrient load/lake response model), has reduced the potential for development of an anoxic hypolimnion and the consequent release of trace elements and nutrients back into the overlying water column.

The primary goal of this lake management plan is to implement management actions that will preserve the improvements in water quality that have been gained by Coeur d'Alene Lake since the 1970's. These fairly recent improvements in water quality could be eroded by the present pattern of rapid increases in population growth, lake usage, and land development now occurring throughout the basin. The management plan also seeks improvements in water quality where needed to achieve compliance with federal and state water quality criteria.

The water quality management actions recommended for the four water quality management zones are weighted heavily toward reducing nutrient loadings produced by point and nonpoint sources within the basin. The purpose of these reductions is to achieve a sequence of three responses within Coeur d'Alene Lake: reduced in-lake nutrient concentrations: reduced biological production by phytoplankton, periphyton, and macrophytes; and a reduced hypolimnetic dissolved oxygen deficit.

Coupled with this strategy to manage the lake's trophic state and thereby prevent releases of trace elements and nutrients out of the lakebed sediments is the desire to reduce water column concentrations of zinc so they will not exceed federal water quality criteria for the protection of freshwater aquatic life. Reduced zinc concentrations are to be achieved largely through reductions in zinc loadings produced within the Coeur d'Alene River Basin.

The environmental factors controlling phytoplankton production in lakes are numerous; nutrients, particularity phosphorus, have repeatedly been found to be major factors. Trace elements have infrequently been reported as significantly affecting phytoplankton production, either as a nutritional deficiency or as a toxicant. In the case of Coeur d'Alene Lake, the phytoplankton bioassays indicated that the biologically-available, dissolved concentrations of zinc in the northern two-thirds the lake exerted a strong suppression on phytoplankton growth. Similar results were also reported by two studies conducted on the lake in the early 1970's. These results raise an important issue for water quality management in Coeur d'Alene Lake: If zinc concentrations are reduced enough to comply with federal water quality criteria, will the

lake's phytoplankton production markedly increase? If the answer to the question is affirmative, then nutrient loadings will need to be reduced, perhaps significantly, in order to counteract the lifting of zinc's suppressive effect on phytoplankton production.

DEFINITION OF ACRONYMS

Numerous acronyms are used throughout the document. They are defined as follows:

* ACOE, U.S. Army Corps of Engineers
* ACP, Agricultural Conservation Program
* ASCS Agricultural and Stabilization Service
* BC, Benewah County
* BLM, U.S. Bureau of Land Management
* CAC, Citizen's Advisory Committee for CBIG,
* CBIG, Coeur d'Alene Basin Interagency Group
* CBRP, Coeur d'Alene Basin Restoration Project
* CES, Cooperative Extension Service, University of Idaho
* CLCC, Clean Lakes Coordinating Council
* CT, Coeur d'Alene Tribe
* DEQ, Idaho Division of Environmental Quality
* EPA, U.S. Environmental Protection Agency
* FG, Idaho Department of Fish and Game
* FPA, Idaho Forest Practices Act
* FPAAC, Forest Practices Act Advisory Committee
* ICL, Idaho Conversation League
* IDHW, Idaho Department of Health and Welfare
* IDL, Idaho Department of Lands
* DWR, Idaho Department of Water Resources
* IFC, Idaho Forestry Council
* ILA, Idaho Loggers Association
* IPR, Idaho Department of Parks and Recreation
* ITD, Idaho Department of Transportation
* IWR, Idaho Department of Water Resources
* KC, Kootenai County
* NIBCA, North Idaho Building Contractors Association
* NRCS, Natural Resource Conservation Service
* NRDA, Natural Resources Damage Assessment
* PAC, Panhandle Area Council
* PHD, Panhandle Health District
* AWQP, State Agricultural Water Quality Program
* SC, Shoshone County
* SCD, Soil Conservation Districts
* UI, University of Idaho
* USCG, U.S. Coast Guard
* USDA, U.S. Department of Agriculture
* USFS, U.S. Forest Service
* USFWS, U.S. Fish and Wildlife Service
* USGS, U.S. Geological Survey
* WPCA, Water Pollution Control Account
* WWC, Waterways Commission
* WWP, Washington Water Power.

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APPENDIX A

List of Technical Advisory Group Members

DEVELOPMENT T.A.G.

Chairman
Plummer-Gateway Hwy Dist.

Pat Allen
Shoshone County

Dale Beeks
The Network

Pierre Bordenave
Intermountain Resources

Jerry Botts
Benewah County Planning
& Zoning

Larry Comer
Welch Comer Engineers

Roy Cook
Coeur d'Alene C of C NRC

John Crouter
KEA

Maria Dobson
City of Harrison

Sandy Emerson
CDA C of C NRC

Shireene Hale
Panhandle Health District

Deb Hamm
The Network

Kim Hanna
CDA Assn. of Realtors

Harvey Hansen

Bud Harvey

Rogene Hingston
Spokane River Association

Dave Karsann
Idaho Dept. of
Transportation

Paul Klatt
J-U-B Engineers

Chris Hardy
Coeur d'Alene Tribe

Carl Mattingly
SF CDA River Sewer
District

Bill McKenna
Lakeshore Construction

Ray Mobberley
Worley Highway District

Mike Mongelli
Shoshone County Planning
& Zoning

Gloria Palmer

Buddy Paul
CDA Lake Homeowners
Association

Anne Pressentin
IDEQ

Lisa Prochnow
CLCC
Panhandle Health District

Pat Raffee
Concerned Businesses

Ken Renner
Eastside Highway District

Jan Scharnweber
KEA

Clyde Sheppard
Spokane River Association

John Tindall
IDEQ

Rand Wichman
Kootenai County Technical
Services Div.

Rhonda Wilcox
City of Harrison

Karen Williams
KEA

Dave Yadon
City of Coeur d'Alene
Planning Department

Al Vogel
St. Maries Gazette-Record

RECREATION T.A.G.

Mike Anderson
Kootenai County
Commissioner

Phillip Cernera
Coeur d'Alene Tribe

Roy Cook

Tom Ellefson

Mike Galloway

Peter Grubb

Shireen Hale
Panhandle Health Dist.

Harry Hansen

Don Matthews

Dr. O.B. Scott

Mar. Sheriff Niles Shirley

Jeff Thomas
Kootenai County Sheriff

SOUTH LAKE T.A.G.

John Daniels
Coeur d'Alene Tribal Member

Gene Hedlund

Dr. Bill Latshaw
Round Lake

Jess Marratt, Facilitator
Coeur d'Alene Tribe

George Mills, Jr.
Benewah County Commission

Bill Morris
Idaho Farm Bureau

Lisa Prochnow
CLCC
Panhandle Health District

Gregory Runyan
St. Maries Wild Rice

Mitch Silvers
Idaho Dept. of Parks & Rec.

AGRICULTURE T.A.G.

David Brown
USDA-SCS

Mike Combes
SCS-Beneway County

Bob Hanson
KEA

Kathie Hasselstrom
SCC

Kootenai-Shoshone SCD

Phil Lampert
Benewah SCD

Robert Mahler
University of Idaho
Dept. of Soil Science

Vickie Parker-Clark
UI Coop. Ext. Service

Lisa Prochnow
CLCC
Panhandle Health District

Mike Schlepp
Save Our River Env.

Fred Schoenick
Benewah Cattlemen's
Assn.

Kelly Scott
St. Joe Valley Assn.

Al Sharon
KEA

Ed Tulloch, Facilitator
IDEQ

Jim Wilson
Kootenai-Shoshone
Cattlemen's Assn.

FOREST T.A.G.

Director, Assn. of
Logging Contractors, Inc.

Jim Colla
Idaho Dept. of Lands

Bill Cook
Bureau of Land Mgmt.

Chip Corsi
Idaho Dept./Fish & Game

Chris Hardy
Coeur d'Alene Tribe

Joe Hinson
Intermtn. Forest Ind. Assn.

Ed Javorka, Facilitator
Coeur d'Alene Tribe

Dean Johnson
Idaho Dept. of Lands

Joan Kerttu
Idaho Forest Owners Assn.

Janel McCurdy
CDA Tribe Forest Mgr.

Dale McGreer
Potlatch Consultant

Mike Mihelich
KEA

Ron Payton
SCS

Lisa Prochnow
CLCC
Panhandle Health District

Gary Rahm
Idaho Panhandle Nat. Forests

Chris Schnepf
US AG Extension Office

Brett Stinnett
Plum Creek Corp.

Brian Sugden
Plum Creek Lumber Co.

Larry Wright
Potlatch Corp.

RIVERS T.A.G.

Art Bookstrom
USGS Geologic Division

Jerry Botts
Benewah County Planning & Zoning

Ray Bradley
Kootenai County Waterways Adv. Com.

Bill Dreisbach
Benewah Canoers

Dan Felton
River Subdivisions

Chuck Finan
Coeur d'Alene Tribe

Frank Frutchey
SORE

Harvey Hansen
Benewah Co. Waterway Adv. Com.

Dolly Hartman
St. Joe Valley Assoc.

Bud Harvey
St. Joe River Boat Club

Geoff Harvey, Facilitator
IDEQ

Eric Johnson
WWP

Ken Knoblock
Idaho Dept. of Water Res.

Farrell Krupp

John Nigh
Idaho Dept./Fish & Game

Will Pitman
Idaho Dept. of Lands

Lisa Prochnow
CLCC
Panhandle Health District

Gregg Rayner
US Army Corps of Engineers

Fred Schoenick

Bill Seaton
Shoshone County Waterways Adv. Com.

Eric Shulbert
KEA

Mitch Silvers
Heyburn State Park

Neil Smith
St. Joe Valley Assn.

Les Soul
Army Corps of Engineers

Mike Stevenson and Terry Kincaid
Bureau of Land Mgmt.

Melinda Wetzel-Smith

APPENDIX B

Listing of priority and general concerns expressed by the public during public meetings of July 1993

Letter sent to public participants at Lake Planning meetings.

October 12, 1993

Subject: Public input on Lake Coeur d'Alene Management Plan

During July a series of public meetings were sponsored by the Idaho Division of Environmental Quality and the Coeur d'Alene Tribe. these meetings were designed to identify the issues and concerns most important to the general public in order, if possible, to incorporate them into the Lake Coeur d'Alene Management Plan.

The agency indicated that a summary of the discussions would be distributed to those meeting participants who provided names and addresses. Enclosed is a summary of the issues and concerns expressed by the participants at each meetings.

The Lake Management Plan workgroup will study these issues and concerns as a part of its work. Wherever possible the group will attempt to incorporate those which are relevant into the plan alternatives. Some, which are beyond the scope of a Lake Management Plan, will be forwarded to the appropriate government official or legislator for response.

Draft alternatives for the lake plan are projected to be developed by January 1994. At that time another round of public meetings will be scheduled in order to obtain public input and comment on the draft alternatives.

If you have questions concerning the issues summary of the lake planning process, please address them to me at (208) 769-1448.

Sincerely,

Geoffrey W. Harvey
Idaho Department of Environmental Quality

Enclosure

Coeur d'Alene (day) GROUP A

Priority Concerns

1) Involve public with policy making on lake and surrounding land.

2) Public supported ombudsman for lake issues.

3) Fish and Wildlife habitat improvement to include public ownership of shoreline and improvement for these purposes.

4) Educate public about proper use of the lake and waters.

5) Lack of enforcement of existing rules and regs.

General Concerns

* More monitoring of ag and timber activities.
* Maintain human and wildlife co-habitation and use of the lake area.
* Drainage control and increased rate of runoff from more intense uses.
* Speed, noise, shoreline erosion from boating activities.
* Reduce input of heavy metals into lake by 80%.
* Reduce density of shoreline development and increase setbacks.
* Educate public about proper use of the lake waters.
* Overuse of lake for recreation use (big boats, jet skis, noise).
* Control overuse and abuse of lake development.
* Fish & wildlife habitat improvement to include public ownership of shoreline and improvement for these purposes.
* Lack of enforcement of existing rules and regs.
* Reduce nutrient input from sewage systems, ag and boats.
* Involve public with policy making on lake and surrounding land.
* Promote and support common sense use of resources, wildlife, recreation and economic opportunities.
* Large wakes.
* Public supported ombudsman for lake issues.
* Stop use of lake for transport and storage of logs.
* Heavy taxation causing accelerated of large parcels.
* Tax level.
* Protect Rathdrum aquifer from degradation.

Coeur d'Alene (day) GROUP B

Priority Concerns

1) Stormwater from residential and recreation roads.

2) Erosion (shoreline).

3) Implementation of lake management plan.

4) Development of effective regulatory tools.

5) Agricultural impacts.

General Concerns

* Erosion (shoreline).
* Implementation of Lake Management Plan.
* Stormwater from residential and recreation roads.
* Expanding superfund to entire basin.
* Septic wastewater/boat gray water.
* Development of effective regulatory tools.
* Agriculture impacts.
* Timber harvests.
* Reduce upstream sediment loading.
* Control development density of shoreline.
* Control of marine noxious weeds.
* Emphasis on wetland protection.
* Steep slope development (safety and aesthetics).
* Erosion on old roads and trails.
* Regional sewage treatment facility.
* Airborne pollution.

Coeur d'Alene (day) GROUP C

Priority Concerns

1) Local economy, custom and culture and people, i.e. natural resource economy.

2) Family recreation, public use, access.

3) Base action on proof. What is real and needed?

4) Balance ecosystem management.

5) Local and state control.

General Concerns

* Local economy, custom and culture and people (i.e. natural resource economy).
* Family recreation, public use and access.
* Fund and enforce implementation.
* Industry participation.
* Local and state control.
* Coordination and reconciliation at all levels, agreement.
* Base action on proof. What is real and needed?
* Balanced ecosystem management.
* Health.
* Realistic use of lake.
* Fighting Creek landfill.

Coeur d'Alene (day) GROUP D

Priority Concerns

1) Identify demonstratable health risks.

2) Concern over nutrient loading and eutrophication (ag, logging activities, development, stormwater, etc.)

3) Noise from boats and jet skis.

4) Unchecked residential and other development.

5) Safe for recreation use (fishable/swimmable) and others (special resource water).

General Concerns

* Are there feasible means to remediate contaminants within the watershed?
* Do we need a complete aquifer study to complete knowledge base?
* Number and size of boats (aesthetic fulfillment and enjoyment).
* Erosion of banks and shores by boats.
* Protection of downstream water quality.
* Noise -- boats and jet skis.
* Lack of enforceable regs on recreation and development.
* Safe for recreational use (fishable/swimmable) as in special use designation (special resource water).
* Identify demonstratable health risks
* Industrial use by logging -- transportation, storage, handling.
* Pave county roads next to lake (dust).
* Shortage of outdoor facilities (recreational support).
* Concern over nutrient loading and eutrophication (sediment plus others).
* Total cost of remediation with and without litigation.
* Recreational use (fishing/boating) versus commercial use.
* Unchecked residential development (subdivisions).
* Information on how to live in this area, i.e. heavy metal problems, lake use, fish, gardens, development. Impact of heavy metals on wildlife.
* Population growth exceeding capacity of natural systems and infrastructure.
* Protection of domestic water -- ground and surface.

Coeur d'Alene (day) GROUP E

Priority Concerns

1) Elimination of nutrient inputs for prevention of weed growth.

2) Better enforcement of forest practices rules to prevent erosion and nutrient inputs.

3) Prevent sedimentation from ag, grazing activities, nutrients, bacteria.

4) Forestry.

5) Fisheries impacts from above.

General Concerns

* Development pressures.
* Elimination of nutrient inputs for prevention of weed growth.
* Better enforcement of forest practices rules to prevent erosion and nutrient inputs.
* Prevent sedimentation from agriculture, grazing activities, nutrients, bacteria.
* Forestry.
* Fisheries impacts from above.
* Union Pacific Railroad right of way.
* Pollutants of concern: nutrients (forestry, ag, livestock and residential).
* Pollutants of concern: sediments (forestry, ag, livestock, residential and mining).
* Quality of life due to increased population and recreation, ie. noise, trash, sanitation, visual. Lack of enforcement, resources, education.
* Protect traditional ceremonial uses i.e. fishing, drinking, aesthetics.
* Environmental sustainability with economic development. Coordination of authorities.

Coeur d'Alene (day) GROUP F

Priority Concerns

1) People -- local economy, custom and culture, i.e. natural resource economy.

2) Family recreation, public use access.

3) Implementation, fund and enforce.

4) Industry participation.

5) Three issues tied for fifth:

   a) Coordination and reconciliation at all levels -- agreement.
   b) Local and state control.
   c) Public access to lake model -- nutrient loading info.

General Concerns

* Industry participation.
* Balanced ecosystem management.
* BMP's -- give sawyers responsibility for culvert and drainage structures installed during their work i.e. prevent soil erosion.
* Public access to lake model -- nutrient loading info.
* Local and state control.
* Phosphate loading from boats and homes.
* Realistic recreational use of lake.
* Fighting Creek runoff.
* Health.
* Fiscally conservative.
* People -- local economy, custom and culture i.e. natural resource economy.
* Coordination and reconciliation at all levels/agreement.
* Family recreation, public use access.
* Heavy metals loading.
* Implementation, fund and enforce.
* Community needs natural resources.

Coeur d'Alene (day) GROUP G

Priority Concerns - Stage 1

1) Superfund cleanup and river above superfund.

2) Loss of floodplains, wetlands.

3) Pressures on lake -- heavy boating, traffic on river, bank erosion caused by boats.

4) Stormwater and drainage impacts.

5) Preserving expanding fisheries.

Priority Concerns - Stage 2

1) Development, construction, setbacks on slopes, lakeshore.

2) Nutrient loading from agriculture, mining and logging.

3) Public education, awareness, involvement.

4) Heavy metal pollution.

5) Land use planning, enforcement, regulation (leadership).

General Concerns - Stage 1

* Adequate funding for implementation.
* Heavy metals pollution (existing and additional).
* Development on banks, slopes, shoreline, road building, setbacks.
* Public awareness, education of public to importance, public involvement.
* Preserving, expanding fisheries.
* Stormwater and drainage impacts.
* Consumer pressure on lake -- heavy boating, traffic on river, bank erosion caused by boats.
* Land use planning, implementation, enforcement.
* Interest group conflict resolution.
* Preservation of visual qualities.
* Agricultural/silvaculture input contribution (logging, mining, ag).
* Agency management coordination (goal orientation).
* Public access.
* Loss of flood plains, wetlands.
* Meeting management, maximize education and input.

* Nutrient loading.
* Superfund cleanup and river above superfund.
* Tribal, state, county relations.
* Sewage pollution.
* Remediation of lower Coeur d'Alene River.
* Lake bottom disturbance, fills.
* Lakewater -- drinking source.
* Election of sympathetic local and state officials.

General Concerns - Stage 2

* Agriculture, mining, logging nutrients.
* Public awareness, education involvement.
* Development and construction on banks and slopes, i.e. setbacks.
* Heavy metals pollution.
* Adequate funding for implementation.
* Land use planning, enforcement, regulations (leadership).
* Fisheries -- preservation and use.
* Stormwater, septic tank drainage impact.
* People pressure and impact -- boating traffic, use, litter.
* Loss of wetlands, flood plains.

Coeur d'Alene (day) GROUP H
(This group divided their list into goals & priorities.)

Priority Concerns

GOALS:

1) For Lake -- stabilize metals in place and manage nutrients to preserve beneficial uses.

2) For Basin -- maintain or restore all beneficial uses and address health concerns.

PRIORITIES:

1) Funding and implementation.

2) Erosion, including agriculture, forest practices and regulation.

3) Stormwater, including roads and development.

4) Sanitary waste, including nutrients.

5) Preserve natural areas.

General Concerns

GOALS:

1) For Lake -- stabilize metals in place and manage nutrients to preserve beneficial uses.

2) For Basin -- maintain or restore all beneficial uses and address health concerns.

PRIORITIES:

1) Funding and implementation.

2) Erosion, including agriculture, forest practices and regulation.

3) Stormwater, including roads and development.

4) Sanitary waste, including nutrients.

5) Preserve natural areas.

Coeur d'Alene (evening) GROUP E

Priority Concerns

1) Three items tied for first:

   a) Improve fish and wildlife habitat by public purchase and improvement.
   b) Involve public in policymaking on lake surrounding land use issues.
   c) Public supported ombudsman for lake issues.

2) Educate public about proper use of the lake waters (courtesy, right-of-way, etc.)

3) Two items tied for third:

   a) Maintain human and wildlife co-habitation and use of the lake and surrounding area.

   b) Lack of enforcement of existing rules and regulations.

General Concerns

* Develop method of reducing taxes, example: by conservation easements.
* Rules and regulations are too vague and hard to enforce.
* Improve fish and wildlife habitat by public purchase and improvement.
* Involve public and policymaking on lake and surrounding land use issues.
* Does fishing derby have effect on salmon population?
* Change logging practices to minimize sediment into river and lake.
* Public supported ombudsman for lake issues.
* Rules and laws regarding riparian rights, the highway level, public access to beach areas.
* Educate public about proper use of the lake waters (courtesy, right-of-way, etc.)
* Recognize importance of the shallow bays.
* Use the lake as a laboratory to acquaint children with lake ecology.
* Monitoring of boat activity and impacts.
* Maintain human and wildlife co-habitation and use of the lake and surrounding areas.
* Lake of enforcement of existing rules and regulations.

St. Maries GROUP A

Priority Concerns

1) Want to maintain current uses of natural resources and present way of life in Benewah County.

2) More local government control in the project.

3) Wise multiple use management of all resources versus preservation/no use management.

4) Want economic stability for the area.

5) Preserve the culture, history and traditions of local community.

General Concerns

* Wise multiple use management of all resources versus preservation/no use management.
* Does good science tell us there really is a problem with the lake?
* Want to maintain current uses of natural resources and present way of life in Benewah County.
* Preserve the culture, history and traditions of local communities.
* Concern that nutrient threshold may be so low as to limit our current manner of resource uses.
* Want to see local government (county commissions) be responsible for final decisions.
* More local government control in the project.
* Am concerned about clean water.
* The existing rules, regs, ordinances need to be tied into the process.
* Would like to see public property exempt from management concerning this project.
* Would like more disclosure on legislators (names) who promoted the Nutrient Management Act.
* Want to have names and access to final legislative and others who will decide and promoted the lake management plan.
* Want economic stability for the area.
* More proof the scientific data is accurate -- two years of data seems inadequate.
* Use common sense in drafting the lake management plan.
* Need to control the current loading of metals going into the lake.

St. Maries GROUP B

Priority Concerns

1) Local economic survival and stability.

2) Preservation of private property rights in the watershed. (landowners)

3) Multiple use of land.

4) Development on lake with protection of natural resources.

5) Management based on sound science.

General Concerns

* Local economic survival and stability.
* Multiple use of lands.
* Preservation of property rights in the water shed. (land owners)
* Preservation of culture and heritage.
* Limit community development.
* Development on lake with protection of natural resources.
* Greater local government representation.
* Maintain and improve lake fisheries.
* Management of tributaries of the Cd'A River, curtail loading.
* Management that is economically feasible.
* Landowner response toward pollution.
* Riverbank/waterways stability. (landowner's right to maintain/mitigate, i.e. riprap)

St. Maries GROUP C

Priority Concerns

1) Economic stability.

2) Concern over properly identifying pollution sources.

3) Promote and support "common sense" economic diversity use of the lake.

4) How will final plan affect tradition uses "customs and culture" in the Cd'A Basin?

5) Three issues tied for fifth:

   a) Government only by elected representatives of the people or their agents.
   b) Maintain lake resources for human and wildlife co-habitation and development.
   c) Data base should be over longer period of time (more than two years) (funding necessary).

General Concerns

* Economic stability.
* Maintain lake resources for human and wildlife co-habitation and development.
* Less government control.
* Government only by elected representatives of the people or their agents.
* A stable PH level in water and soil adjacent to St. Joe and St. Maries Rivers.
* How will final plan affect traditional uses "customs and culture" in the Cd'A Basin?
* Concern that there is a place for future commercial development.
* Promote and support "common sense" economic and recreational diversity use of the lake.
* Why aren't there restrictions on farmers for soil erosion, chemical use and pesticides?
* Plan alternatives should stress ways to mitigate impacts rather than eliminate activities.
* Taxpayers money will not be spent unless appropriated by elected representatives.
* Economic stability through stable water quality.
* Data base should be over longer period of time (more than two years) (funding necessary).
* Promote wise or multiple use.
* Review and update zoning and taxation laws related to development.
* Is data base accurate for conclusion on nutrient input?
* Economic activities which contribute the most should have more input.
* More monitoring of streams unaffected by human activity.
* Concern over properly identifying pollution sources.
* Develop a communication system for communities surrounding the lake to have the most input.
* Coordinate with local elected officials on implementation.
* Recreation uses.
* Alternatives should not be selected for ease of implementation.
* Could the industries be regulated further without seriously reducing their productivity?

Plummer GROUP A

Priority Concerns

1) No more clearcuts in lake drainages; no more clearcut burns -- maintain natural waterholding capacity of our forests.

2) Preserve our way of life by working with the logging, farming and commercial interests.

   a) Federal, state and bureaus following the same laws, regs, standards as required on private lands.

3) Keep on monitoring the lake for 8-10 years before acting -- get more proof of conditions.

4) Repeal the Nutrient Management Act.

5) Study options of removing metals from lake sediments by creative methods.

General Concerns

* No more clearcuts in lake drainages; no more clearcut burns -- maintain natural waterholding capacity of our forests.
* Control of nutrient loading -- both agricultural nonpoint and point source (sewage).
* Federal, state and bureaus following the same laws, regs, standards as required on private lands.
* Keep on monitoring the lake for 8 to 10 years before acting -- have more proof of conditions.
* Find fertilizers that don't impact water quality as much.
* Maintain the swimmable, fishable standards (legally) in the lake.
* Preserve our way of life by working with the farming, logging and commercial interests.
* Repeal the Nutrient Management Act.
* There have been large improvements in farming and logging practices: question whether there is a problem now.
* Study options of removing metals from lake sediments by creative methods.
* Maintain control development along 500 feet of lake shore.
* Work towards controlling the seaweed and plants in the lake -- they are taking over in some places.
* Maintain buffer zones along streams to prevent impacts by homes, logging, farming, grazing and roads.
* Disallow boat traffic in St. Joe above 5 miles per hour -- is supposed to by the "shadowy" St. Joe, not a race track.
* Consider the downstream impacts in river and aquifer below the lake in Idaho and Washington.
* Disallow the "let burn" policy on national forests -- too much sediment and nutrients.

Plummer GROUP B

Priority Concerns

1) Maintain status quo or improve level of metals, nutrients, sediments.

2) Ongoing public education.

3) Preserve the economic stability of the Coeur d'Alene basin.

4) NEPA requires consideration of "custom and culture" by government.

5) Two issues tied for fifth place:

   a) Human health and fisheries issues related to heavy metals.
   b) Preserve private property rights.

General Concerns

* Human health and fisheries issues related to heavy metals.
* Maintain status quo or improve level of metals nutrient sediments.
* Preserve the economic stability of the Coeur d'Alene basin.
* Preserve private property rights.
* Increase in high paying recreational jobs.
* Maintain or increase agricultural lands.
* Preserve basin for human habitat.
* Ongoing public education.
* NEPA requires consideration of "custom and culture" by government.
* Mental and physical health through natural resources job preservation.
* Consider smaller drainages in the plan for management.
* Protect quality of life.
* Maintain metals at the bottom of the lake.
* Involve elected local governments in formulating and implementing the plan. (local control)
* Address lakeshore development.
* Balance economic stability and recreation.
* Tax monies spent only through direct appropriation by our elected representatives.
* Increase productivity of fisheries and wildlife habitat.
* Add Benewah County to the Management Committee.
* Increase opportunity for the free market.
* Control growth, development and access to critical areas.
* Maintain or increase logging emphasis on salvage.

Kellogg GROUP A

Priority Concerns

1) Economic stability with existing custom and culture (natural resources industries).

2) Private property rights within the basin.

3) People should not be liable for what was legal at the time.

4) Study possible removal of heavy metals at bottom of lake with creative technologies.

5) No boat sewage dumping in the lake.

General Concerns

* Raising and lowering of water level by Washington Water Power.
* Consideration of economics when looking at regulating of nutrients into the lake.
* High volume usage on rivers causing bank erosion.
* Curtail clearcutting.
* People should not be liable for what was legal at the time.
* Nutrient loading.
* Study possible removal of heavy metals at bottom of lake, with creative technologies.
* Protection of county tax base.
* Public awareness and education.
* More public access sites to the lake.
* Heavy bedload in the North Fork Cd'A River.
* High paying recreational jobs vs low-wage recreational jobs/gambling.
* No boat sewage dumping into the lake.
* Private property rights within the basin.
* Declassification of the St. Joe River Road as alternate I-90.
* Economic stability with existing custom & culture. (Natural resource industries).
* Construction on and near lakeshore including road building and runoff--less.

Kellogg GROUP B

Priority Concerns

1) Control of repeated inundations by Washington Water Power raising and lowering lake levels.

2) Control sewage treatment plant discharge.

3) Monitoring sedimentation from clearcuts and control runoff also roads.

4) Listen to the indians.

5) Adequate septic systems for chain lakes.

General Concerns

* Sample wells on south fork, airport area, canyon, and others for metal content.
* More enforced regulations on large development projects.
* Adequate septic systems for chain lakes.
* Cap on development
* Control sewage treatment plan discharge.
* Control of repeated inundations by Washington Water Power raising and lowering lake level.
* Curtail marinas and large boats dumping sewage, oil and gas (also RV dump sites).
* Control sediments and nutrients in runoff.
* Monitor sedimentation from clearcuts and control runoff also roads.
* Increase individual awareness.
* Listen to the indians.
* Check livestock that run too close to the lake shore.
* Commercial fertilizer use for nutrient buildup.
* Control sedimentation from logging, boats, lake level fluctuation.
* Sewer the gulches.
* Tributaries running through mine tailings.

APPENDIX C

Action items addressing non-water quality recreation concerns

The recreation subcommittee of the Development Technical Advisory Group developed several action items unrelated to water quality concern. These action items are the starting point for developing necessary management actions not directly related to water quality management.

APPENDIX C

Boat Use	Priority	Lead	Estimated cost	Funding Sources
Action 1: Develop protection measures (speed and proximity guidelines) for wetland birds, nesting and shoreline areas from turbidity resulting from jetskis and other boat operation around these areas.	2	County Comm.		
Action 2: Encourage good sportsmanship and reduced speeds.	2	County Comm.		

Attachment: Additional Areas of Concern - Activities on the Lake

Noise Levels	Priority	Lead	Estimated Cost	Funding Sources
Action 1: Require testing of motors for noise levels (with license application) and enforcement of acceptable noise levels (especially for jetskis). Jetskis are especially a noise problem to shoreline and lake property owners.	1	IDPR KC BC		

APPENDIX C

Safety and Enforcement Issues	Priority	Lead	Estimated Cost	Funding Source
Action 1: Standardize sign design, size and color of all signs in the 3 counties. Improve diver and swimmer identification for boaters and float-plane drivers.	1	WW Comm.		
Action 2: Increase safety inspections of boats by Sheriffs patrol.	2	WW Comm. KC,BC		
Action 3: Encourage greater enforcement capabilities through increased funding of the Countys Sheriff's Department.	1	KC,BC		
Action 4: Promote boater operator testing and licensing programs.	2	KC,BC WW Comm.		

APPENDIX C

Fisheries: Goal is to maintain or improve the sport fishery of Lake Coeur d'Alene and its tributaries.	**Priority**	**Lead**	**Estimated Cost**	**Funding Sources**
Action 1: Encourage restoration and maintenance native vegetation buffers along the lakeshore and lake tributaries.	1	IDL SCDs USFS BLM		
Action 2: Develop and implement a plan to maintain and, if necessary, improve the stability of stream channels on private, state and federal land. a) Require that some conifers be retained in the stream protection zone of Class II streams (to provide large organic debris (LOD) and maintain the stability of the stream) b) Increase stability the number of large conifers retained in the stream protection zone of Class I streams (to increase LOD). c) Add criteria for residual pool volume and riffle stability index to the state Water Quality Standards.	1	IDL USFS BLM DEQ		
Action 3: Ensure that culverts placed in fish-bearing streams are accessible to fish; retrofit existing drainage structures which are inaccessible to fish; ensure culverts are sized for peak storm events and will accommodate expected debris as well as the discharge.	1	IDFG IDWR IDL USFS BLM		

Abbreviations:

BC	Benewah County
CLCC	Clean Lakes Coordinating Council
CT	Coeur d'Alene Tribe
DEQ	Division of Environmental Quality
EHD	East Side Highway District
CES	U of I Cooperative Extension
F&G	Idaho Dept. of Fish and Game
ICL	Idaho Conservation League
IDL	Idaho Dept. of Lands
ITD	Idaho Transportation Dept.
KC	Kootenai County
KEA	Kootenai Environmental Alliance
NICBA	North Idaho Building Contractors Assn.
PAC	Panhandle Area Council
PGHD	Plummer-Gateway Highway District
PHD	Panhandle Health District
SC	Shoshone County
SCS	Natural Resource Conservation Service
SFCSD	South Fork of Cd'A Sewer Dist.
USFS	U.S. Forest Service
WHD	Worley Highway District

APPENDIX D

Summary of written responses to a questionnaire and public comments expressed during public meetings of April 1994

May 13, 1994

COEUR D'ALENE LAKE MANAGEMENT PLAN

Summary of April, 1994 Public Meeting Comments

A questionnaire with five questions was handed out at each of the public meetings. A total of 76 questionnaires were turned in. A summary of the written comments is summarized below.

QUESTION 1: How do you use and/or enjoy Coeur d'Alene Lake?

The following activities were listed. The number of times the activity was mentioned is in parentheses ().

Boating (35)
Swimming (27)
Aesthetics (24)
Fishing (24)
Cabin/Home (13)
Camping (9)
Non-motorized boating, sailing, canoeing (7)
Recreation (7)
Wildlife/bird watching (5)
Drinking water (4)
Work (3)
Waterski (3)
Scuba diving (2)
Ice skate (2)
Hiking (2)
Hunting (2)
Log transport/storage (2)
Photography (1)
No use (1)

QUESTION 2: Goals for the Lake Management Zones

The tally from the "straw vote" to determine management goals for the lake is:

Nearshore Zone:	44 - slow improvement 29 - rapid improvement
Southern Lake:	46 - slow improvement 28 - rapid improvement
Rivers:	49 - slow improvement 24 - rapid improvement
Open Lake:	55 - slow improvement 9 - rapid improvement 11 - slow zinc improvement; maintain water quality for nutrients

QUESTION 3, 4, and 5: **These questions asked respondents to list their ideas for pollution prevention strategies, remediation/clean up strategies and any other issues of concern.** The written answers were combined for this summary. The responses fell into the following categories: agriculture, boating and recreation, development/land use planning, enforcement, fisheries and wildlife, funding, general pollution sources, general lake management planning, general pollution solutions/comments, lake level fluctuations, landfill, lower rivers, mining effects/heavy metals, public education, road building, stormwater, timber, wastewater, and other. The results are listed below:

AGRICULTURE

-Control sediment from agricultural areas; use BMPs - 9 comments
-Stop livestock grazing in streams and riparian areas - 5 comments
-Institute mandatory agriculture BMPs - 3 comments
-Improve farm practices - 2 comments
-Maintain grass seed production - 1 comment
-Maintain crop rotation program - 1 comment

BOATING AND RECREATION

-Eliminate wastewater dumping from boats, add dump stations - 13 comments
-Limit boat size - 9 comments
-Manage boat speed, wakes in rivers and open lake - 9 comments
-Expand public access/boat ramps - 7 comments
-Control powerboat use, wakes - 5 comments
-Bank erosion from boats - 3 comments
-Limit number of boats - 3 comments
-Don't expand public access - 2 comments
-Manage recreational shoreline use - 2 comments
-Eliminate/ban jet skis - 2 comments
-Public health hazards in recreation areas - 2 comments
-Boat safety - 1 comment
-Limit location of boats - 1 comment
-Restriction on activities in/around lake - 1 comment
-Boat noise - 1 comment

DEVELOPMENT/LAND USE PLANNING

-Control waterfront and basinwide development; better management of - 18 comments
-Manage fertilizer use - 5 comments
-Slow development - 3 comments
-Manage erosion from nearshore development - 1 comment
-Remove old boathouses on lake - 1 comment
-Limit number of marinas on lake - 1 comment

ENFORCEMENT

-Enforce current laws - 5 comments
-Enforce solid waste laws - 1 comment
-Enforce boating regulations 1 comment

FISHERIES AND WILDLIFE: ISSUES/HABITAT

-Manage wetlands for waterfowl - 7 comments
-Fisheries - 6 comments
-Wildlife habitat - 4 comments
-Curb bass fishing - 1 comment

FUNDING

-Seek funding sources - 2 comment
-Use some of local tax money to fund cleanup, diverted from other programs - 2 comments
-Don't increase fees/taxes to fund correction measures - 1 comment

GENERAL POLLUTION SOURCES

-Stop pollution at sources, source control - 14 comments
-Control erosion/sediment from all sources - 5 comments
-Control nutrient discharge - 1 comment
-Prioritize and control pollution at sources - 1 comment

GENERAL LAKE MANAGEMENT PLANNING

-Leave lake alone; do nothing - 3 comments
-Use cooperative and coordinated effort to find solutions - 2 comments
-Speed up studies, plan - 2 comments
-Give greater attention to nutrients vs. heavy metals - 2 comments
-Don't fix it unless it's broken - 2 comments
-No more studies - 1 comment
-Use common sense - 1 comment
-Don't know what needs to be done to manage pollution - 1 comment
-Involve public in process - 1 comment

GENERAL POLLUTION SOLUTIONS/COMMENTS

-Control weed encroachment - 9 comments
-Use non-phosphorous soaps - 2 comments
-Eliminate tire burning - 2 comments
-Dredge certain nearshore areas for boating access - 2 comments

-Protect wetlands as buffers/sinks for pollution - 1 comment
-Use biological control of phosphorous with plants - 1 comment
-Use oxygen infusions - 1 comment
-Don't dredge lake bottom - 1 comment

LAKE LEVEL FLUCTUATION

-Control water level fluctuation - 8 comments

LANDFILL

-Use better siting techniques for landfills; - 5 comments
-Manage landfill better - 1 comment
-Recycling - 1 comment

LOWER RIVERS

-Rip rap river banks - 10 comments
-No wake on St. Joe and Coeur d'Alene Rivers - 3 comments
-Ban powerboats on CDA River - 2 comments
-Limit boat size on rivers - 2 comments
-Manage boat speed, number of boats on CDA River - 2 comments
-Use natural methods to stabilize banks - 2 comments
-Restrict speed on St. Joe River - 1 comment
-Ban powerboats on St. Joe River - 1 comment
-Stabilize CDA River streambanks - 1 comment
-Army Corps of Engineers is preventing bank stabilization efforts - 1 comment
-Bank stabilization - 1 comment

MINING/HEAVY METALS

-Cleanup mining waste - 8 comments
-Heavy metal effects on biota - 1 comment

PUBLIC EDUCATION

-Educate public - 17 comments

ROAD BUILDING

-Control road building - 1 comment

STORMWATER MANAGEMENT

-Better management of stormwater - 6 comments

TIMBER

-Better management of timber harvests - 7 comments
-Stop clearcutting - 2 comments

WASTEWATER: TREATMENT PLANTS/SEPTIC SYSTEMS/COMMUNITY SYSTEMS

-Upgrade the wastewater treatment plant in Page, other treatment plants in watershed, - 14 comments
-Upgrade individual (septics) and community drainfields - 13 comments
-Sewer nearshore areas - 2 comments
-Eliminate discharges from wastewater treatment plants - 1 comment
-Cut off all discharges of raw sewage - 1 comment
-Use alternative sewage disposal systems - 1 comment
-Limit construction of central sewers around the lake 1 comment

OTHER/MISC: CULTURAL SITES, COMMUNITY STABILITY

-Private property rights - 1 comment
-Consider the economy of the community - 1 comment
-Individual responsibility - 1 comment
-Cost estimates in report are inaccurate (ie rip rap) - 1 comment
-Protect cultural sites - 1 comment
-Stop promoting North Idaho - 1 comment

QUESTION AND ANSWER SESSION: The following is a summary of the questions/concerns voiced during the public meetings. Questions fell into the following categories: pollution/data on nutrients and heavy metals, potential management options, the planning process, funding, implementation, enforcement, the questionnaire, Bunker Hill Superfund site, lateral lakes, Fighting Creek landfill, and other.

POLLUTION/DATA

Nutrients:

-What affect does the lake level fluctuation have? (3 questions)
-What causes oxygen increases/decreases in the lake? (2 questions)
-Is there a peer review of USGS data? (2 questions)
-Part of southern lake is man-made, why repair it? (2 questions)
-Is run-off the biggest nutrient loading problem?
-How do the water samples compare to samples taken from mountain streams?

-Was a comparison study done before the river at Cataldo was dredged?
-Is oxygen level as low as USGS says it is?
-Readings in southern lake may not be accurate because in high-water flood stage everything is flushed out.
-How long does phosphorous stay in the system in measurable quantities?
-What accounts for the 80% of naturally occurring phosphorous?
-How can you solve problems if samples have been taken above the St. Joe River?
-Why wasn't pH tested for?
-Are oxygen deficits caused more by sewage treatment than by heavy metals?
-How do ag practices contribute nutrients? Fertilizers?
-Won't the Cherokee Hills project increase pollution problems?
-The Conservation Reserve Program or grass seed weren't mentioned in terms of the farm land. They have a large effect on the sediment entering the lake.
-The study on the Flathead Lake in Montana concluded that less than 5% of the nutrients entering the lake are caused by man.
-What effect does the rice growing industry in Chatcolet Lake have on the lake?
-What kind of shape is the Spokane River in from the mouth of the river to the dam?
-What is the immediate effect of logging within a half mile or so of the lake?
-Concern voiced over the high level of ash in burn areas.
-What portion of the water coming into the lake comes from the St. Joe River?
-What's the history of sewering around the lake?

<u>Metals:</u>

-Are there heavy metals in fish? (2 questions)
-If zinc contained in upper watershed, will zinc be eventually flushed out of the system?
-Do number of boats affect the release of heavy metals?
-What is the extent of heavy metal contamination in fish and wildlife below the Post Falls dam?
-What is the source of the zinc in Lake CDA? Is coming out of the CDA River or from another source?
-What level of zinc are we talking about? How many ppm? How does this compare with amounts in our drinking water?
-You've stated that the lake's condition has improved in the last 50 years because the tailings dumping was ended in the 1960s. Where are the tailings being deposited now?
-In the worst place, how thick is the layer of metals-contaminated sediment?
-From a heavy metals standpoint, how does the north end of the lake compare to the south end?
-Are any of these contaminants (metals) showing up in well water?
-Will the heavy metals that are trapped in the lake soak into the ground water?
-When the lake turns its water over twice a year, does this stir up the metals sediments?
-Will the lowering of the levels of zinc going into the lake increase eutrophication of the lake?
-Is it true that one way to trap the metals-contaminated sediments is to wait for clay deposits to come in and pack it down?
-The years of mining left heavy metals trapped in certain areas along the CDA River. Are those areas identified and are there plans for the clean-up of those areas? Will a 100-year flood help remove these sediments?

MANAGEMENT OPTIONS

-Are willow plantings an option for river bank stabilization?
-Are there hazardous materials involved in dredging?
-If zinc is a problem, shouldn't all boating be stopped on the CDA River?
-Are you considering no wake zones for nearshore areas?
-The draft says the cost of riprapping is $100-$1,000 per square foot, but Medimont project was only $20 per square foot. A misleading statement like this could scare people away from this option.
-Certain parts of the lake are more sensitive than others; will those areas have different criteria?
-What is the likelihood of correcting the problems in Lake CDA, for example the Page wastewater treatment plant?
-Will development around the lake be limited?
-Is the management plan mainly focused on taking some of that metals-contaminated sediment out? -- It can't just stay there.
-Regarding nutrient loading, will you be able to work with the Dept of Lands to develop BMPs?
-Is there a concern over holding tank contents and detergents entering the lake? Would it be beneficial for the county to put up more signs regarding dumping of these contaminants?

PLANNING PROCESS

-Why don't we try to find out what's causing the problem instead of just trying to cure the problem by repairing it?
-Is WWP involved?
-Isn't the goal of this effort to have no one group take responsibility? -- Should we all work together?
-Is local government involved?
-Are private owners on the river approached any differently where the goals are concerned?
-Any thought given to forming a Legal TAG?
-Which TAG responsible for each area
-Will TAGs ideas be recommendations?
-TAGs told that they are bound by law to improve water quality. Maintain not an option. Could maintain be an option?
-Are there both short and longterm goals? Both should be set.
-Lake plan is an excellent idea
-TAGs need info, but don't know where to get it
-Clarify moving target of Rivers TAG/how far upstream?
-Have any studies been done on the fish and wildlife in the lake, and will those studies be included/considered when adopting the final plan?
-Are you going to look at other areas like Kalispell and Tahoe to compare the effects of development on the lake?
-How far have we really come in the last 15 years in developing a lake management plan? Some of the same groups on your TAGs are groups that caused impediments in adopting the plan 15 years ago. Are these people going to cooperate and get something done, or will they come to these meetings to minimize the effects on their own interests? (Commends work that's been done so far to get this plan underway.)

-If all the groups/people on the TAGs get together with the goal to improve the lake and each does something toward this goals, then the water quality in the lake will improve. (cooperation needed)
-When this plan is final, will it be reviewed annually or otherwise? Is this review process built into the regulatory structure of the plan?

FUNDING
-Who will pay the bill for implementation? (2 questions)
-Will private property owners have to foot the bill?
-Is would be nice if some current prop. tax money was used for maintenance or improvement of the lake.

IMPLEMENTATION
-How will the plan be implemented once completed? (2 questions)
-Why spend money fixing something that doesn't necessarily need fixing?
-Are you talking only about management or will there be remediation (e.g. dredging) as well?
-Will the final plan be voluntary or mandatory? How will it be enforced? Will the plan itself become law? Will it ultimately promote new regulations?

QUESTIONNAIRE
-Can you prioritize the management areas/pollution problems (nutrients/zinc/heavy metals) in terms of severity to make it easier to fill out form? (3 questions)
-Define slowly/rapidly (2 questions)
-What are the benefits of rapid improvement vs slow? (2 questions)
-The question of "slowly" or "quickly" is academic. If we choose quickly, where will the money come from?
-What is the impact on people living on the lake once the choice of slow or rapid is chosen?

SUPERFUND
-How does this effort relate to the Bunker Hill Superfund project?
-Are there plans for cleaning the Superfund site first? Wont that loosen sediments/metals?
-What is the effect of the Bunker Hill site on the CDA River?

LATERAL LAKES
-Are lateral lakes included in lower river zone?
-Is there info available to lateral lakeshore residents?
-Will there be public hearings on lateral lake study?
-Have shoreline studies been done yet?
-What area is encompassed in the lateral lake project?
-How will the CDA Lake Management Plan affect recreational use in the lateral lakes? (need rivers to access lakes)
-Are there heavy metals in lateral lakes?
-How do lateral lakes fit into this plan?

LANDFILL

-Some property taxes went into the landfill at Fighting Creek--which further polluted the lake.
-How many more landfills like the one at Fighting Creek will be going in? When will they be cut off?
-The landfill attracts seagulls. Don't they also contribute pollution to the lake?

OTHER

-Will there be a study on human health risks if metals are released into water column?
-Will this project help the public understand that this is another chapter in a long history of basin problems?
-When will the USGS scientific report be released?